JAN 31 1938
MEDICAL LIBRARY

CANADIAN PUBLIC HEALTH JOURNAL

DEVOTED TO PREVENTIVE MEDICINE

VOLUME 29 **January, 1938** NUMBER 1

Atmospheric Pollution in Toronto

HUGH BARRETT

Adequate School Examination

GRIFFITH BINNING

Industrial Cadmium Poisoning

F. M. R. BULMER, H. E. ROTHWELL and E. R. FRANKISH

Isolation of Influenza Virus

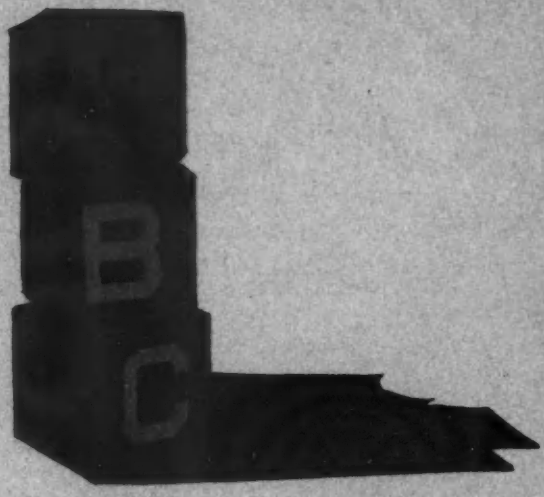
R. HARE and C. H. YEN

●

ABSTRACTS OF PAPERS FROM THE CHRISTMAS MEETING OF THE LABORATORY SECTION

PUBLISHED MONTHLY BY THE
Canadian Public Health Association
105 BOND STREET, TORONTO, ONTARIO

As simple as



mineral–vitamin therapy with **"CALCIUM A"**

An ideal restorative in debility following influenza and the common cold

"Calcium A" provides a simple and effective medium for mineral-vitamin therapy . . . a dietary supplement that enriches the diet with calcium and phosphorus as well as vitamins A and D.

"Calcium A" is a rational supplement to virtually any prescribed diet and constitutes a valuable dietary adjunct during pregnancy and lactation, convalescence, or in any condition where additional calcium and phosphorus are desirable.

Each "Calcium A" capsule exhibits the full vitamin A and D value of one teaspoonful of cod liver oil (U.S.P. XI) in association with approximately 70 mgms. of organically combined calcium and phosphorus.

AYERST, McKENNA & HARRISON
LIMITED
Biological and Pharmaceutical Chemists
MONTREAL • • CANADA

CANADIAN
PUBLIC HEALTH JOURNAL

VOL. 29, NO. 1 JANUARY, 1938

Atmospheric Pollution in Toronto, Canada*

HUGH M. BARRETT

Department of Physiological Hygiene
School of Hygiene, University of Toronto

A GREAT stimulation of interest in the problem of atmospheric pollution occurred in many parts of the world during the first decade of this century. From 1911 to 1914 the Mellon Institute of Industrial Research in Pittsburgh was engaged in a comprehensive study of air pollution (1). This investigation dealt with the economic, meteorological, botanical, engineering and health aspects of the smoke problem. In addition there was published a bibliography of the literature on smoke and smoke prevention, comprising over 150 pages of references.

The most significant finding in the Pittsburgh study was that relating to the economic loss, estimated as $10,000,000 annually. This cost was made up of waste fuel, increased cleaning bills, ruined merchandise and corrosion of buildings.

The results of the investigation concerning the effects of smoke on health were not so clearly defined. A statistical study indicated that a smoky atmosphere might be a factor in the number of deaths from pneumonia, whereas no relationship between atmospheric pollution and tuberculosis death-rates could be demonstrated. Studies of the lung tissue of urban dwellers, at autopsy, showed the presence of large deposits of carbonaceous material. It was suggested that smoke particles present in the lungs of an individual suffering from pneumonia exerted a deleterious effect by obliterating the lymph spaces. In the case of tuberculosis, where resolution depends on fibrosis and encapsulation, the presence of smoke, it was stated, might even be favourable.

**Presented before the Industrial Hygiene Section at the twenty-sixth annual meeting of the Canadian Public Health Association, Ottawa, June, 1937.*

The results of an earlier statistical study by Ascher of Konigsburg, Germany, were summarized by the Pittsburgh investigators. Ascher had concluded that the marked increase in acute respiratory diseases that had occurred since 1875 was due to the pollution of the air by smoke.

It has been repeatedly suggested by public health workers in Great Britain that smoke may be an important factor in the higher mortality rates of urban centres when contrasted with the rates in rural districts.

The difficulty, however, of drawing conclusions from such studies is obvious. The findings are influenced by so many variable factors that it is impossible to attribute increased mortality or morbidity to smoke alone. At present, all that can be said is that smoke may be a factor affecting health, but that definite proof is lacking.

Probably of greater importance is the pollution of the atmosphere with sulphur fumes. Coal, particularly bituminous coal, contains considerable quantities of sulphur which on combustion is emitted as sulphur dioxide. Sulphur dioxide is a powerful irritant and in Great Britain, where fog is a common occurrence, diffusion of this gas is hindered to such an extent that it is frequently present in distinctly irritating concentrations. That such conditions may be harmful can hardly be questioned. Fortunately in this country, due to the generally lower relative humidities, this question is not one of major significance.

That smoke causes a considerable loss in the amount of radiant energy reaching the earth's surface has been well established. Many studies have shown that the short ultra-violet radiation is reduced from 40 to 60 per cent. by the smoke layer present in the cities investigated. Whether this diminution is significant from a health standpoint is not definitely known. The literature regarding the physiological significance of ultra-violet energy is voluminous. Some evidence exists to show that ultra-violet radiation may be of value in surgical tuberculosis and in certain skin diseases. Specific lethal effects on micro-organisms have been demonstrated. At the present time, however, the only definitely measurable physiological effect for human beings is exerted by the region in the sun's spectrum lying below 3024 A.U. This narrow band acts as a prophylactic and therapeutic agent in rickets. A controlled experiment carried out as a part of the Toronto investigation showed that smoke, in concentrations normally occurring in urban atmospheres, diminished the ultra-violet energy to an extent where it ceased to prevent rickets in rats (2). Further data have since been obtained which establish a quantitative relationship between the experimental and external conditions.

Numerous investigations of the extent of atmospheric pollution in large cities in various parts of the world have been made. In 1914 a committee for investigation of atmospheric pollution began its studies in the British Isles and these observations have been made continuously (3). In the United States the Mellon Institute, as part of its investigation in 1912, studied the extent of pollution in Pittsburgh (1). Further studies were conducted in 1923 (4) and in 1929 (4). Studies have also been made in Chicago (5), Cleveland (6), Salt Lake City (7), Baltimore (8), Washington (9), and Grafton,

West Virginia (10). In 1930 $25,000 was appropriated by the United States Government for the study of air pollution. The results of surveys conducted from 1931 to 1933 in 14 large cities in the U.S.A. have been published recently. Investigations have also been made in Osaka, Japan (12), Hamburg and Berlin in Germany, and in Paris, France. The results of the European studies have been summarized in the Chicago report (5).

THE TORONTO STUDY

An investigation of air pollution in Toronto was begun late in 1932. Although a by-law limiting the emission of dense smoke has been in force for some years, casual observation showed that the condition of Toronto's atmosphere left much to be desired. Experience in other parts of the world has shown that effective smoke-abatement measures must rest on a basis of accurate quantitative information regarding the degree of existing pollution. For this reason the present study was undertaken. As far as the author is aware, this is the first study of the kind conducted in a Canadian city.

TABLE I

GAUGE NO. 1. KEELE ST. AND ST. CLAIR AVE.

METRIC TONS PER SQUARE KILOMETRE—AVERAGES

Month	Mean temp.	Rain inches	Insoluble matter			Soluble matter		Total solids	Included in soluble matter	
			Tar	Carbon	Ash	Loss on ignition	Ash		Sulphates SO_3	Ammonia
Jan. 33	33.5	1.61	0.09	0.64	6.25	4.64	2.52	14.14	1.88	0.89
Feb. 34	10.2	0.93	0.03	0.88	3.67	3.26	3.44	11.28	1.90	....
Mar. 33	31.5	1.69	0.01	2.10	5.60	1.27	0.52	9.50	0.37	0.22
Apr. 33	45.0	2.56	0.01	2.66	6.82	0.47	1.20	11.16	1.07	0.25
May 33 34	57.6	0.78	0.03	2.93	7.06	0.29	0.99	11.30	0.68	0.11
June 33 34	67.8	2.30	0.06	2.18	6.37	0.82	1.01	10.44	0.77	0.05
July 33 34	72.2	1.56	0.03	2.41	4.25	1.03	0.70	8.42	0.40	0.03
Aug. 33 34	67.3	1.71	0.03	1.73	5.88	0.85	0.91	9.40	0.59	0.04
Sept. 33 34	55.7	2.80	0.07	4.15	3.93	0.85	0.85	9.85	0.83	0.02
Oct. 34	48.6	1.31	0.04	2.68	4.46	0.35	0.46	7.99	0.81	0.03
Nov. 33	31.7	2.90	0.03	2.82	3.81	1.56	1.38	9.36	....	....
Dec. 32	30.5	2.40	0.04	0.52	5.45	3.72	2.42	12.15	....	1.19
Year totals		22.55	0.47	25.7	63.6	19.1	16.4	125.0	9.40	2.83 (10 months)
Averages	45.9	1.88	0.04	2.14	5.30	1.59	1.37	10.40	0.94	0.28
Year totals—tons* per sq. mi.			1.35	73.5	182.	54.6	46.9	358.	26.6	8.10
Per cent of total solids			0.4	20.5	50.9	15.2	13.0	100.	7.43	2.2
Average monthly deposit—winter		1.91	0.03	1.75	5.15	2.18	1.70	10.79	1.20	0.34
Average monthly deposit—summer		1.83	0.04	2.68	5.49	0.74	0.89	9.88	0.65	0.05

*The short ton (2,000 pounds).

Measurement of Air Pollution

A number of methods may be employed to measure air pollution. To permit of comparison, the methods developed by the committee which conducted similar studies in Great Britain were adopted (3) (first and second report).

The gauges used for measuring deposited impurity were funnel-shaped

TABLE II

GAUGE NO. 2. KING ST. AND UNIVERSITY AVE.

METRIC TONS PER SQUARE KILOMETRE—AVERAGES

Month	Mean temp.	Rain inches	Insoluble matter			Soluble matter		Total solids	Included in soluble matter	
			Tar	Carbon	Ash	Loss on ignition	Ash		Sulphates SO_3	Ammonia
Jan. 33 34 35	26.7	1.65	0.19	9.93	13.90	1.62	1.94	27.58	0.99	0.13
Feb. 33 34 35	19.7	1.13	0.19	11.75	12.31	2.07	2.36	28.68	1.50	0.08
Mar. 33 34 35	31.8	1.79	0.19	10.56	10.89	1.40	1.39	24.43	1.17	0.09
Apr. 33 34 35	43.6	1.30	0.06	5.37	5.18	0.51	1.03	12.15	0.96	0.04
May 33 34 35	55.7	1.09	0.08	5.81	6.52	0.46	0.53	13.40	0.61	0.02
June 33 34 35	66.4	2.67	0.09	5.14	8.51	0.81	1.47	16.02	0.64	0.06
July 33 34 35 36	72.8	1.87	0.07	4.92	6.38	0.63	0.68	12.68	0.48	0.01
Aug. 33 34 35 36	68.4	1.41	0.07	3.68	7.22	0.55	0.77	12.29	0.48	0.09
Sept. 33 34 35 36	61.8	2.92	0.15	4.73	8.18	0.90	1.18	15.14	1.01	....
Oct. 33 34 35	48.9	1.72	0.13	7.45	6.74	0.50	1.05	15.87	0.71	0.02
Nov. 34	42.1	3.10	0.08	6.17	5.00	0.69	1.02	12.96	0.85	....
Dec. 32 33 34	26.8	2.07	0.23	6.81	10.38	1.69	2.78	21.89	1.68	0.09
Year totals		22.72	1.53	82.3	101.2	11.8	16.2	213.	11.1	0.63 (10 months)
Averages	47.1	1.89	0.13	6.85	8.42	0.98	1.35	17.75	0.92	0.06
Year totals—tons per sq. mi.			4.4	234.	291.	33.9	46.4	610.	31.6	1.81
Per cent. of total solids			0.7	38.7	47.5	5.5	7.6	100.	5.2	0.3
Average monthly deposit—winter		1.82	0.15	8.32	9.20	1.21	1.65	21.93	1.12	0.07
Average monthly deposit—summer		1.99	0.09	4.86	7.32	0.67	0.92	13.90	0.64	0.04

vessels constructed of enamelled iron. Their catchment area was approximately 4 square feet. All material falling into the funnel was collected in a 20-litre bottle placed beneath the gauge.

Four gauges were placed at the following locations in Toronto:

No. 1. Near Keele Street and St. Clair Avenue (near large abattoirs, stockyards, and railway sidings).
No. 2. Corner of King Street and University Avenue (business district near railway terminal).
No. 3. School of Hygiene, near College Street and University Avenue (public buildings and residential section).
No. 4. Connaught Laboratories Farm, 6 miles north of Eglinton Avenue (rural area).

TABLE III

GAUGE NO. 3. SCHOOL OF HYGIENE BUILDING

METRIC TONS PER SQUARE KILOMETRE—AVERAGES

Month	Mean temp.	Rain inches	Insoluble matter			Soluble matter		Total solids	Included in soluble matter	
			Tar	Carbon	Ash	Loss on ignition	Ash		Sulphates SO_3	Ammonia
Jan. 33 34 35	26.7	1.65	0.06	3.89	4.48	1.15	1.39	10.97	0.85	0.08
Feb. 35	22.4	0.86	0.01	5.10	7.00	1.21	0.89	14.21	0.38	0.03
Mar. 33 35	33.5	1.36	0.02	6.31	7.82	1.12	0.89	16.16	0.78	0.07
Apr. 33 34 35	43.6	1.30	0.05	3.99	4.77	0.58	0.72	10.11	0.77	0.05
May 34 35	54.9	1.09	0.02	2.80	4.44	0.31	0.52	8.09	0.50	0.02
June 34 35 36	66.4	2.67	0.06	3.00	4.10	0.63	0.92	8.71	0.68	0.08
July 33 34 35 36	72.8	1.87	0.05	1.66	2.89	0.69	0.64	5.93	0.51	0.04
Aug. 33 34 35 36	68.4	1.41	0.04	2.70	3.91	0.43	0.74	7.82	0.65	0.04
Sept. 33 34 35 36	61.8	2.92	0.06	1.52	3.67	0.35	0.44	6.04	0.55	0.02
Oct. 33 34 35	48.9	1.72	0.05	2.95	3.82	0.34	0.92	8.08	0.81	0.01
Nov. 34	42.1	3.10	0.12	2.62	4.15	0.66	0.77	8.32	0.77	....
Dec. 32 33 34	26.8	2.07	0.05	5.16	6.36	0.85	2.36	14.78	1.42	0.04
Year totals		22.02	0.59	41.7	57.4	8.3	11.2	119.	8.7	0.48 (11 months)
Averages	47.4	1.83	0.05	3.48	4.29	0.69	0.93	9.95	0.72	0.04
Year totals—tons per sq. mi.			1.7	119.	164.	23.8	32.	341.	24.8	1.35
Per cent. of total solids			0.5	34.9	48.1	7.0	9.3	100.	7.25	0.04
Average monthly deposit—winter		1.72	0.19	4.29	5.48	0.84	1.13	11.79	0.84	0.04
Average monthly deposit—summer		1.99	0.04	2.33	3.80	0.48	0.65	7.31	0.57	0.04

Tables 1, 2, 3 and 4 summarize the findings. The figures given are averages. The number of years of observations used in compiling the average is indicated in each case. Pollution was greatest in amount at station 2 (King Street and University Avenue) and, as was to be expected, was least at station 4 (Connaught Laboratories Farm). An indication of the source of pollution at some of the stations is reached by an examination of the average monthly deposit for summer and winter. The period of from May to September, inclusive, was considered as summer, and October to April as

TABLE IV

GAUGE NO. 4. CONNAUGHT LABORATORIES FARM

METRIC TONS PER SQUARE KILOMETRE—AVERAGES

Month	Mean temp.	Rain inches	Insoluble matter			Soluble matter		Total solids	Included in soluble matter	
			Tar	Carbon	Ash	Loss on ignition	Ash		Sulphates SO_3	Ammonia
Jan. 33 35	27.2	1.72	0.01	0.17	0.80	0.08	0.14	1.20	0.05	0.02
Feb. 33 35	16.3	0.90	0.05	1.03	2.20	0.96	0.84	5.08	0.25	0.02
Mar. 33 34 35	31.8	1.79	0.03	0.76	3.06	0.55	0.52	4.92	0.30	0.03
Apr. 33 34 35	43.6	1.30	0.06	1.39	3.10	0.50	0.55	5.60	0.31	0.12
May 33 34 35	55.7	1.09	0.02	1.47	2.35	0.79	0.82	5.45	0.34	0.01
June 33 34 35	66.4	2.67	0.04	0.86	1.85	0.48	0.61	3.84	0.24	0.04
July 33 34 35 36	72.8	1.87	0.04	1.07	1.12	0.54	0.45	3.22	0.28	0.04
Aug. 33 34 35	68.1	1.29	0.04	0.60	1.53	1.33	1.65	5.15	0.48	0.04
Sept. 33 34 35 36	61.8	2.92	0.02	0.59	0.99	0.49	0.47	2.56	0.22	0.04
Oct. 33 34 35	48.9	1.72	0.02	0.57	0.78	1.09	0.95	3.41	0.30	0.05
Nov. 34	42.1	3.10	0.04	0.33	0.45	0.31	0.20	1.33	0.35	....
Dec. 32 33 34	26.8	2.07	0.02	1.16	2.17	0.49	0.84	4.68	0.21	0.04
Year totals		22.44	0.39	10.0	20.4	7.61	8.04	46.4	3.33	0.45 (11 months)
Averages	46.8	1.87	0.03	0.83	1.70	0.64	0.67	3.87	0.28	0.04
Year totals—tons per sq. mi.			1.1	28.6	58.3	21.8	23.0	133.	9.52	1.29
Per cent. of total solids			0.83	21.5	43.8	16.4	17.3	100.	7.2	0.97
Average monthly deposit—winter		1.80	0.03	0.77	1.79	0.56	0.57	3.74	0.25	0.04
Average monthly deposit—summer		1.96	0.03	0.91	1.56	0.72	0.80	4.04	0.31	0.03

winter. At station 1 (Keele Street and St. Clair Avenue) there was little difference noted between the summer and winter monthly averages of total solids deposited. Approximately the same situation prevailed at station 4 (Connaught Laboratories Farm). At station 2 (King Street and University Avenue) and station 3 (School of Hygiene) the amounts of total solids, tar and carbon were all considerably greater during the winter months. This would indicate that a considerable part of the pollution at these locations was occasioned by heating plants. It is obvious that exact conclusions cannot be drawn from such data. Pollution settling at a given point may have originated at a very considerable distance. This fact is well demonstrated by the sulphate deposits obtained at station 4. Sulphates result entirely from the combustion of fuel and during the summer months no considerable source of fuel combustion was nearer to this gauge than about six miles.

The increased fuel-consumption during the winter is again reflected by the consistently larger sulphate deposits that occurred during the winter months at all three gauges located within the city.

A comparison of the deposited impurity in Toronto with that found in some areas in the British Isles that showed maximum pollution from 1926 to 1930 is presented in figure 1. The amount of pollution settling in Toronto is as great as has been found in badly-polluted areas of Great Britain. Some

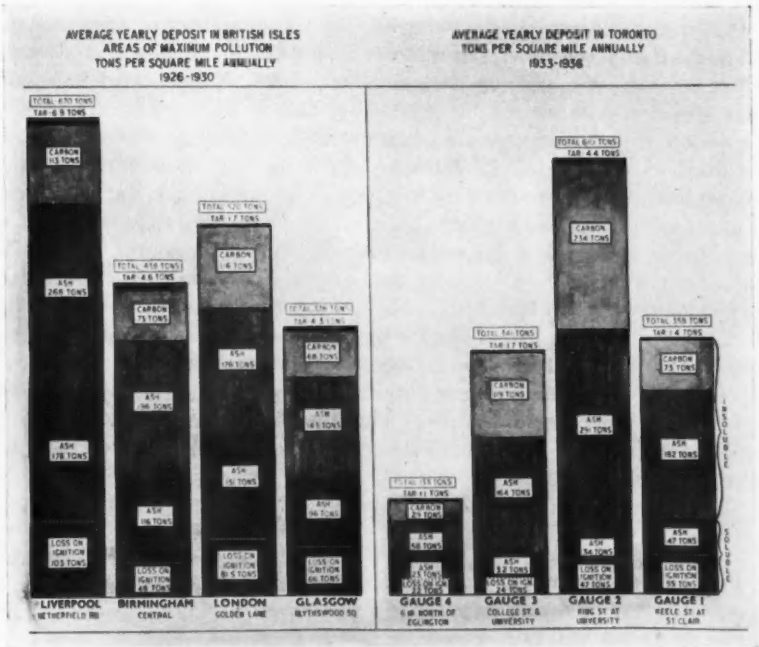


FIG. 1

marked differences in the percentages of the various constituents of the deposit are apparent on comparing the Toronto and British figures. A much greater part of the British deposit consists of soluble impurity. This is undoubtedly partially due to the fact that the average annual rainfall in Great Britain is greater than in Toronto, the British investigators having found that an approximately direct relationship between rainfall and the amount of soluble impurity exists. On the other hand, a much greater percentage of the Toronto deposit consisted of carbon, indicating an inefficient combustion.

It should be mentioned that the results of investigations in several cities in the U.S.A. indicate a considerably greater amount of deposited impurity than was found in the Toronto study. Since pollution gauges differing in type from those used in Toronto were employed, comparison has been limited to the results obtained in the British Isles. To these figures could be added those for Osaka, Japan. Using a similar pollution-gauge the annual deposit found for the whole city of Osaka during 1928-29 amounted to 278 tons* per square mile annually.

In addition to the determination of deposited impurity, the material suspended in the atmosphere was estimated by means of an Owens automatic air filter, which was located in a third-floor laboratory at the School of Hygiene. Outside air was conducted to the filter through ten feet of glass-tubing. The instrument has been described fully in the 4th report of the Advisory Committee on Atmospheric Pollution (3). Its method of operation is as follows: Every ten to fifteen minutes two litres of air are filtered through the outer edge of a circular disc of filter-paper. A clock-work mechanism turns the filter disc one revolution in every twenty-four hours. The material suspended in each two-litre air sample remains behind on the filter-paper in the form of a spot 1/8″ in diameter. The amount of pollution that was present in the air is estimated by comparing the blackness of each spot with a standard scale of shades. Each unit of shade on the standard scale corresponds to 0.32 mg. of suspended impurity per cubic metre of air. This relationship was obtained, however, for London, England. As has been shown by United States workers (11), the proportion of material that produces blackening of the filter paper is different in the air of different cities and even in the same city will vary with the season of the year. For this reason conversion of the shade numbers obtained on the records to a weight basis is subject to a large possible error. This possibility was recognized by the British investigators. In view of this finding the Toronto records have been expressed in shade numbers.

The average hourly variation of suspended impurity in Toronto for each month of the year is shown in figure 2. The peculiarly shaped curves with maxima occurring in the morning and evening are typical of all records that have been taken with the air filter both in Great Britain and the United States. As will be shown later, the shape of the British curve is somewhat different from that of curves obtained on this continent.

*The short ton (2,000 pounds).

It is generally believed that the early morning maximum on each curve is associated with the starting of fires. While agreeing with this assumption in a general way, the United States investigators (11) have presented evidence which indicates that the shape of the curve depends also upon meteorological conditions. Most important of these were found to be the air currents rising off the ground; these currents tended to carry the pollution to the upper atmosphere.

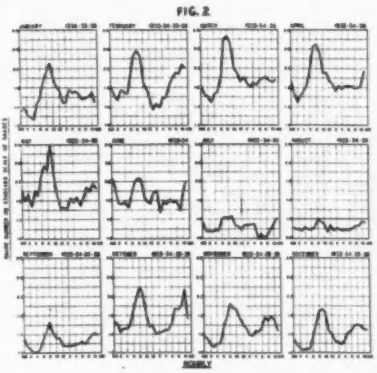
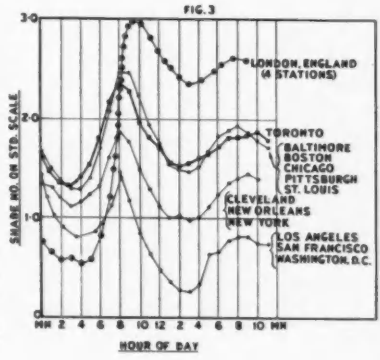


FIG. 2. Hourly suspended impurity in Toronto air for each month of the year.



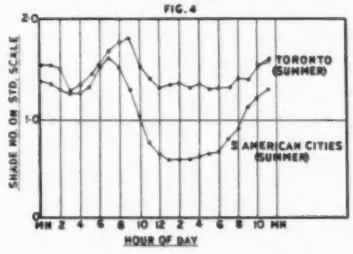


FIG. 4. Comparison of the amount of suspended impurity in Toronto air with that in five U.S.A. cities (summer months).

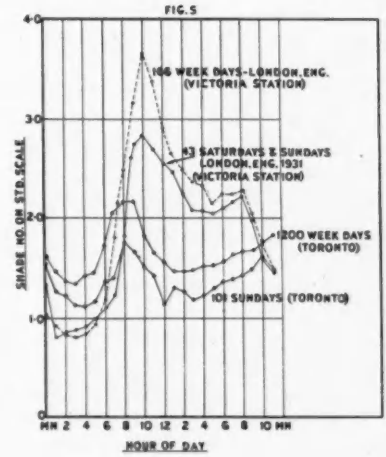


FIG. 5. Comparison of week-day and Sunday pollution in Toronto and in London, Eng.

In figure 3 the average hourly pollution for the winter months (October to April) in Toronto is compared with similar findings in other cities. Due to the longer winter in Toronto, the number of so-called winter months differs from the number used in the studies of other countries. The general shape of the hourly pollution-curves are remarkably similar for all cities on this continent. The pollution curve for London, England, while showing the same

two maxima, indicates much lower pollution at night and a higher pollution during the day. Although the amount of impurity in Toronto air during the winter was considerably less than was found in London, England, it was almost identical with the average amount found in the five U.S.A. cities which showed maximum pollution (Baltimore, Boston, Chicago, Pittsburgh and St. Louis). On the other hand, the amount of suspended impurity in Toronto during the summer (May to September) was considerably more than was found during the summer (April to October) in the same five cities in the U.S.A. (figure 4). It is difficult to explain why the summer level of pollution for Toronto is higher than for the U.S.A. cities. While the maximum amount of suspended pollution in ten U.S.A. cities occurred in December, the maximum in Toronto was in May. The investigators in the United States found a definite relationship existing between the mathematical product (wind velocity $\times$ temperature) and the amount of suspended impurity. No such relationship could be established in the present study. It is obvious that some relationship between wind, temperature and atmospheric pollution should exist since low temperatures are associated with an increased use of fuel and winds tend to disperse smoke. On the other hand many local conditions, such as the direction of the wind, eddy currents set up by neighbouring buildings, and the amount of smoke actually produced, will influence the records to a great extent. Since it is reasonable to assume that in May the production of smoke would be less than in the colder months, the larger amount of suspended impurity in Toronto air during this month must be ascribed to failure of the smoke to disperse. Whether this condition is peculiar to the location of the air filter or is true for the city as a whole can be settled only by measurements taken at other locations.

An indication of the proportion of pollution resulting from industrial sources can be obtained by comparing the amount of suspended impurity present in the air on Sundays and week-days. As some industries operate on a seven-day basis, and railway locomotives and steamships will also contribute smoke every day, this comparison will not give the total pollution that originates from sources other than heating plants. Figure 5 shows the average hourly suspended impurity in Toronto for 101 Sundays compared with that for approximately 1,200 week-days. Similar records obtained in London, England, have been plotted for comparison. The difference between Sunday and week-day pollution is of the same magnitude in Toronto as was found in London, England. Similar differences between the pollution on Sundays and week-days were reported by the U.S.A. investigators. It is apparent that the greater part of Toronto's pollution is of non-industrial origin.

DISCUSSION

Although definite proof is lacking to show that smoke is significant from a health standpoint, future studies may demonstrate that smoke exerts a definitely deleterious effect. In the meantime purely economic and aesthetic

considerations should supply sufficient stimulus to bring about control of a wasteful and unpleasant situation.

The results of the present investigation have shown that the amount of atmospheric pollution in Toronto is as great as has been found in badly polluted areas in the United States and Great Britain. In view of this finding it seems reasonable to suggest that a more adequate effort should be made to bring about some abatement of the condition that exists in Toronto. The quantitative results that have been obtained in the present study will serve as a base line for future surveys to show if smoke-abatement measures that may be taken have been effective.

SUMMARY

Measurements of the amount of atmospheric pollution present in Toronto, Canada, during the years 1933 to 1936 have been made. The methods developed by the committee for investigation of atmospheric pollution in Great Britain were used. Deposited impurity was measured at three locations within and at one location outside the city. Monthly analyses of the deposited tar, carbon, ash, sulphates, ammonia, soluble and insoluble impurity and total solids, were carried out. Total solids deposited at the three locations within the city averaged 341, 358 and 610 tons per square mile annually, compared with an annual deposit of 133 tons found at the gauge located outside the city.

Suspended impurity in Toronto air was measured with an Owens automatic air filter. During the winter the average hourly suspended impurity was less than was found in London, England, but was almost identical in amount with that found in five cities in the United States showing maximum pollution. During the summer there was more impurity suspended in Toronto air than was found in the same five U.S.A. cities. Comparison of pollution present in the air on Sundays and week-days showed the greater part of Toronto's pollution to be of non-industrial origin. The difference between the amounts of Sunday and week-day pollution in Toronto was of the same magnitude as that found in London, England.

On the basis of the results of the present survey it is suggested that more adequate measures should be taken to control the smoke nuisance in Toronto.

Grateful acknowledgment is made to the Director of the Toronto office of the Dominion Meteorological Service for making available various records, and to Dr. J. G. FitzGerald, Director of the School of Hygiene, for his stimulating interest in the investigation.

BIBLIOGRAPHY

(1) Mellon Institute of Industrial Research and School of Specific Industries. Smoke Investigation Bulletins 1 to 9, 1912-14. Bulletin 10, 1922.

(2) Barrett, H. M.: The Antirachitic Effect of Ultra-violet Radiation transmitted by a Smoky Atmosphere. J. Indust. Hyg., 1935, *17*: 199.

(3) Annual Reports of the Advisory Committee on Atmospheric Pollution. First to Sixth reports, Supplements to The Lancet, 1916-1920. Seventh to Twenty-first reports, H. M. Stationary Office, 1922-1936.

(4) Meller, H. B.: Clean air an achievable asset. J. Frank. Inst., 1934, *217*: 717.

(5) Smoke Abatement and Electrification of Railway Terminals in Chicago. Report of Chicago Association of Commercial Committee of Investigation on Smoke Abatement and Electrification of Railway Terminals. W. F. M. Goss, Chief Engineer, Rand McNally & Co., Chicago, 1915.
(6) Green, H. W.: Atmospheric Pollution Analyses, 1927-1929, Cleveland Health Council, Cleveland, Ohio, 1929.
(7) Monnett, O., Perott, G. St. J., and Clark, H. W.: Smoke Abatement Investigation at Salt Lake City, Utah, U.S. Bureau of Mines, Bulletin 254. Printing Office, Washington, 1926.
(8) Shrader, Coblenz and Korff: Effect of Atmospheric Pollution upon Incidence of Solar Ultra-violet Light. Am. J. Pub. Health, 1929, *19*: 717.
(9) Kimball, H. H., and Hand, I. F.: Investigation of the Dust Content of the Atmosphere. U.S. Month. Weather Review, 1924, *52*: 133; 1925, *53*: 243; 1931, *59*: 349.
(10) Monnett, O., and Hughes, L. R.: Smoke Abatement Investigation at Grafton, W. Va., Bureau of Mines, Tech. Paper 338, U.S. Govt. Printing Office, Washington, 1924.
(11) Ives, J. E., Britten, R. H., Armstrong, D. W., Gill, W. A., Goldman, F. H.: Atmospheric Pollution of American Cities for the Years 1931 to 1933. Pub. Health Bull. No. 224, U.S. Govt. Printing Office, Washington, 1936.
(12) Fujiwara, K.: Investigation on Smoke Abatement in Osaka. World Power Conference Sectional Meeting, Tokyo, 1929.

Freshmen Grow in Stature

AS there has been considerable discussion about the stature of university students during the past few years, it may be of interest to compare the figures of the University of Toronto students with those of some of the leading American universities. From these it will be seen that our students stand first in height and second in weight, thus tying with Harvard for first place in general average:

COMPARATIVE STATISTICS ON STATURE OF FRESHMEN

University	Height Inches	University	Weight Pounds
Toronto	69.88	Harvard	148.2
Harvard	69.5	Toronto	144.51
Princeton	69.28	Stanford	144.36
Yale	69.24	Yale	143.52
Stanford	69.21	California	142.58
California	69.05	Texas	142.36
Texas	69.01	Wisconsin	141.94
Minnesota	68.56	Princeton	141.55
Cincinnati	68.55	Minnesota	140.66
Cornell	68.48	Cornell	139.93
Wisconsin	68.25	Coll City, New York	139.42
Coll City, New York	67.02	Cincinnati	138.64

That the general average is increasing is shown by the following figures: Among 665 Harvard freshmen, average age 18 years, the gain in height during the past 15 years is 1½ inches, and in weight 5.2 lbs.

Among the 820 Toronto freshmen (1937-38), average age 18½ years, the gain in height compared with the freshmen of 1921-22 is 1¾ inches, and in weight 7½ lbs. In this year's class of freshmen, there are 152 who are six feet tall or taller, with an average weight of 159 lbs. Approximately every sixth freshman this year is six feet tall or over.

George D. Porter, M.D.,
University of Toronto Monthly, December, 1937.

Adequate School Examination*

GRIFFITH BINNING, M.D.

Medical Director of Schools, Saskatoon, Sask.

THE purpose of a school medical service, conducted continuously as part of regular school routine, is to improve the health of the school child. Conceptions of health may vary considerably. The practising physician, on the one hand, may consider a child in good health when he has established the absence of any pathological condition or disease. The school medical officer will probably take a broader view. For instance, he may consider the child to be not in good health who, though physically perfect, develops a new distaste for school, loathes it and plays truant at every opportunity.

Cause of School Absence

In accord with this broader conception, a two-year survey of absences from school has been conducted at the Caswell School, Saskatoon, a school which, from the viewpoint of social and economic status, racial origin and illness, can be considered as representative of the average in the city. The causes of absence and the time lost are shown in table I. Absences due to valid reasons other than

TABLE I

Caswell School Survey, 1934-35

Reason for Absence	*Number*	*Half-days Absent*
Social duties	39	64
Home duties	350	559
Religious duties	3	7
Weather	67—459	106—736
Truancy	16	16
Parental indifference	216	340
Clothing relief	22	33
No clothing	19	44
No reason given	19—292	25—458
Chicken-pox	38	642
Pertussis	16	615
Mumps	1	15
Scarlet fever	1	24
Tuberculosis	11	21
Vincent's angina	4	31
Scarlet-fever contact	4	64
Mumps contact	2	5
Chicken-pox contact	5	70
Sore-throat contact	1— 83	1- 8148
Impetigo	11	195
Scabies	22	304
Ringworm	1	10
Conjunctivitis	9— 43	35— 544
Colds in head	397	989
Colds in chest	172	947
Sore throat	233	780
"Flu"	23	152
Diarrhoea	302- 1127	683- 3551
Vaccinations and inoculations	7— 7	9— 9
Burns	4	10
Cuts	6	16
Frost bite	2	12
Fractures	3	47
Sprains	5	17
Other accidents	71— 91	291—393
Tonsillectomy	17	121
Appendicectomy	5	327
Herniotomy	1— 23	20— 468
Boils	12	45
Rheumatic pains	10	29
Adenitis	22	132
Pneumonia	4	346
Headaches	168	215
Earaches	27	200
Indigestion	37	81
Appendicitis	8	36
Abdominal pain	3	43
Heart disease	3	34
Miscellaneous	130— 424	394- 1555
Dental	87— 87	165— 165
Total	2636	9367

**Presented at the seventh annual meeting of the Saskatchewan Health Officials Association, Saskatoon, June 4, 1937.*

SUMMARY

	Absences		Half-days Absent	
	Number	Per cent.	Number	Per cent.
Necessary absence, non-illness	459	17.4	736	7.9
Unnecessary absence, non-illness	292	11.1	458	4.9
Infectious diseases, reportable	83	3.1	1488	15.9
Infections of skin and eye	43	1.6	544	5.8
Infectious diseases, not reportable	1127	42.8	3551	37.8
Vaccinations and inoculations	7	.3	9	.1
Accidents	91	3.5	393	4.2
Operations	23	.9	468	5.0
All other illnesses	424	16.1	1555	16.6
Dental conditions	87	3.3	165	1.8
	2636	100.0	9367	100.0

ill health accounted for 7.9 per cent. of all time lost; those not due to ill health and for which the reason given could not be considered adequate, the second group, accounted for 4.9 per cent.; while illness accounted for over 87 per cent. of all time lost. The reportable communicable diseases accounted for 3.1 per cent. of absences and 15.9 per cent. of the total time lost; infections of the skin and eyes for 5.8 per cent. of total time lost, and non-reportable epidemic disease for 42.8 per cent. of all absences and 37.8 per cent. of all time lost. Further, 22 cases of adenitis, 4 of sinusitis, 6 of croup, 27 of earache and otitis media, 4 of pneumonia and 1 of nephritis occurred coincidently with these non-reportable epidemics and were undoubtedly due to them, whereas not one complication or sequela has been observed in connection with the cases of reportable disease. That is why, after eight years as a school physician, I feel that we are isolating and quarantining the wrong individual. I have never seen one defect due to mumps, German measles or chicken-pox and, consequently, see no reason even for isolating cases of these diseases. With satisfactory means available for immunization against diphtheria, pertussis and smallpox, it seems but logical to allow those contacts who have been immunized freedom from quarantine, fully realizing at the same time the possibility of their being carriers. Certainly this is just as logical as our present system of allowing "streptococcic throats" to roam at will.

It is evident in these tables that the school medical officer who limits his work to trying to prevent the spread of reportable infectious disease, deals only with approximately 5 per cent. of absences from school and neglects 95 per cent.

SOCIAL STATUS AND ILLNESS

The children in the school were classified A, B, C, and D, in accordance with the following criteria:

Class A: Children whose parents, no matter how lengthy or how unusual the illness, can afford the most expensive treatments.

Class B: Children whose parents can afford to look after any ordinary illness without beggaring themselves.

Class C: Children whose parents are earning less than $65.00 per month with two children. An additional $5.00 per month is allowed for each additional child.

Class D: Children whose parents are on relief.

The distribution of children in Caswell School and the distribution of all illnesses are shown in table II.

TABLE II

ILLNESS ACCORDING TO ECONOMIC STATUS

Class	Distribution of children %	Distribution of illness %	Ratio
A.....	1.5%	0.3%	.2
B.....	24.3%	10.5%	.43
C.....	63.0%	76.9%	1.22
D.....	11.2%	12.1%	1.08

Here it is evident that the vast majority of the children, 74 per cent., fall into classes C and D, and that these suffer 89 per cent. of all illness. The contrast between classes A and C is striking, the latter class suffering approximately six times the rate of illness suffered by A. Class C, it is to be noted, suffer even a slightly higher rate than class D. It is questionable whether any form of State medicine would eliminate this contrast. What is needed is a general raising of the standard of living in class C so that they can have at least the same diet and opportunities for early treatment of defects as those in class D enjoy in this city.

PERSONAL HISTORY AND PHYSICAL EXAMINATION

The work indicated or implied thus far is largely that of a public health officer, but this is not enough for the school medical officer. The findings of the routine examination indicate the field and necessity for further work. It is our practice in Saskatoon, owing to lack of time, to see our 6,300 children in the clinic every three years; that is, in grades I, IV, and VII. These clinics often become deadly monotonous and it is only the knowledge that sooner or later one will "jump into the interesting case" that "keeps one going" on certain days. We have found everything from chronic intestinal indigestion to carcinoma of the caecum, from tuberculous meningitis to smallpox, from scapelocephy to flat feet.

We believe that two-thirds of a physical diagnosis is an adequate history. To obtain this before-hand and thus save time we send home a questionnaire for the parent to complete. This outlines the purpose of having a medical director of schools, and explains the necessity for having a physical examination and a history of the child's health and illness. In order to facilitate its completion the various diseases and conditions in regard to which information is desired are listed. Not only are there questions in regard to the past history of

diphtheria, whooping cough, scarlet fever, measles, German measles, mumps, chicken-pox, infantile paralysis, rheumatism, sore throat or growing pains, heart disease, pneumonia, recurrent cough and other serious illnesses or operation, but also in regard to the vaccination of the child against smallpox, diphtheria, scarlet fever and whooping cough. Enquiry is made too, of possible tuberculosis contact. The form indicates the time of the examination and especially invites the parent or guardian to be present and to confer with the Director of Medical Services on any problem involving the child or his health. Advantage is taken of such opportunities to indicate the necessity for and value of available immunization procedures.

THE EXAMINATION

The clothing is removed to the waist, shoes removed, and the child weighed and measured by the nurse, who records also the reading for the Snellen chart. A complete or semi-complete physical examination is given, including measurement with calipers at the intercristal line. This measurement is most important in estimating weights as we have found the ordinary height-age-sex chart very misleading. It requires the narrow child to weigh too much and he is then classified as malnourished when he certainly is not; but more important, the Baldwin-Wood chart often fails to indicate underweight children when they are of the very wide type. It was a surprise to note how often this discrepancy was revealed when we started to use the height-age-sex-width chart. On the other hand we feel that the Helen Pryor chart stresses width too much.

Occasionally exceptions are made to the general rule and the certain diagnostic procedures are carried out. For instance, the urine is examined when suspicion of urinary infection indicates the necessity for it. A haemoglobin determination may be done to check the suspicion of anaemia. Experience teaches, however, that haemoglobin estimates from the clinical picture are usually correct. Blood counts are never done except at the "after-four" clinic. Blood samples for Wassermann tests are taken when indicated. Routine tuberculin tests were done this year in our pre-entrance clinic of 460 children; the test was done on 336 and of these 12 or 3.66 per cent. showed a positive reaction.

Table III shows the incidence of various defects found in the first examination of 15,105 children. It must be remembered that a school clinic, in the opinion of the writer, should not be a diagnostic clinic. It has not the necessary diagnostic facilities such as x-ray equipment or laboratory services, etc., so that diagnoses made and recorded in the clinic are not considered to be final, but in reality represent clinical impressions, sometimes so exaggerated that the staff goes back to watch the child more carefully than would be the case otherwise. For instance, there are 82 cases listed as having tuberculosis. These 82 consist of all children who have been discharged from sanatoria as cured, or are under observation as probably arrested tuberculosis, together with those children who have a "chest history" and give a positive intracutaneous tuberculin reaction, and children who have a "chest history" in a known tuberculous family who have never had x-ray examination and tuberculin test to rule out tuberculosis.

TABLE III

FINDINGS IN FIRST EXAMINATIONS OF 15,105 PUPILS

Condition	Number	Percentage of Children
Normal	4,229	28.0
Dental defects	2,098	13.9
Underweight	2,059	13.6
Postural defects	662	4.4
Spinal defects	167	1.1
Chest structural defects	291	1.9
Defects of extremities	261	1.7
Poor vision	1,918	12.7
Stabismus	186	1.2
Other eye defects	153	1.0
Diseased tonsils	3,310	21.9
Nasal defects	528	3.5
Hearing defects	148	1.0
Other ear defects	226	1.5
Speech defects	97	0.6
Heart defects	404	2.7
Tuberculosis history	82	0.5
Other chest diseases	503	3.3
Nervous diseases	148	1.0
Low mentality	261	1.7
Skin diseases	388	2.6
Tuberculosis contacts	214	1.4
Goitre	344	2.3
Metabolism defects	139	0.9
Eneuresis	189	1.2
Hernia	193	1.3
Phimosis	90	0.6
Others	568	3.7

However, the table does give us some rough idea of what we usually find and it is valuable for this purpose, keeping the above facts in mind. We notice that 28 per cent. of our children were without defects; that inability to read the test table, defective teeth, infected tonsils and tonsils to be rechecked, and underweight predominate; that the more serious conditions such as carcinoma and sarcoma, early heart lesions, curious mental traits, etc., are discovered only by examination.

RECORDS

On the medical card are recorded the information in regard to age, personal history of past illness, vaccinations, etc., as obtained from the questionnaire sent to the parents, the age, height, width, weight, normal weight and the percentage above or below normal, any defects found, the I.Q., and mental age. There is space for record of treatment of defects and, on the back of the card, for the findings of later examinations. There is, thus, adequate provision of space for both medical history and physical findings of the average case. This makes for accuracy and completeness so that the medical director is not infrequently consulted by his medical colleagues. The medical cards are filed after the diagnoses are transferred to the nurse's card, which follows the child from school to school. The nurse's card has space also for recording social and economic status, dental defects and their disposition as well as later data of height, weight, defects, clinic attendance, etc. Finally, a printed form is used for reporting the findings to the

parent or guardian, who is requested to consult the family physician in regard to any specified conditions requiring attention and also invited to confer with the medical director if desired. The notice particularly points out that the child is not excluded from school.

THE COSTS OF MEDICAL INSPECTION

The cost of this service is best shown in comparison with the other school costs. They are shown below:

Actual cost of all salaries		$283,607.76
" " " maintenance of buildings		14,914.80
" " " financing district	$ 20,127.22	
" " " debenture charges	134,373.46	
		154,500.68
Medical and dental services including salaries, transportation and supplies		12,766.05
Miscellaneous		38,979.55
Total		$504,768.84

In other words, the service accounted for 2.5 per cent. of all school cost, for 8.3 per cent. of the cost of financing, 4.5 per cent. of the salary budget, or, in fact, about the cost of the light, water, laundry and telephone service. Any city can give a similar service for like cost and, from my experience as a country physician, I have no hesitation in saying that the service can be given in the rural parts, on a province-wide basis, at less cost.

Curiosity in regard to the results of the service prompted the review of the findings in 665 children who had been followed from the primary grade to the highest. It is encouraging to find that of all defects capable of improvement, improvement was recorded in nearly 70 per cent.

CRITICISMS

Owing to lack of staff we are unable to do all that is needed. Examination of children should be done every year instead of every three years. Our nurses visit half our schools twice a week and the other half once a week. It should be possible to have the nurse visit each school each day.

Apart from special visits it is not possible for our staff to give any home instruction. I feel that this would more than repay the additional cost.

We do not give any inoculations as they are given by the medical officer of health. There is no good reason for duplicating existing facilities. And at present our activities are legally restricted to the school child and do not include the pre-school group.

We miss things. Of course we do. It is impossible to do everything without missing something, but I think diagnosis is at least reasonably satisfactory.

Industrial Cadmium Poisoning

A Report of Fifteen Cases, Including Two Deaths

F. M. R. BULMER AND H. E. ROTHWELL
Division of Industrial Hygiene
Department of Health of Ontario

AND

E. R. FRANKISH
Medical-Legal Laboratory
Department of Attorney-General of Ontario

THE use of cadmium in industry has increased greatly in the last few years, due to its value as a protective metallic coating applied by electroplating or metallizing and its inclusion in certain specialized solders.

While considerable information has existed for many years on the toxicology of cadmium and its salts when taken by mouth it is only recently that detailed experimental work was carried out regarding the danger from breathing its dusts or fumes. A very comprehensive history of cadmium poisoning and the uses of cadmium was published in 1932 (1) by Leon Prodan which makes further remarks regarding this phase of the problem unnecessary.

In Ontario during the last two years there have been two instances where poisoning from cadmium via the respiratory tract has occurred. In one case (Plant 1) only one man was affected and he recovered. In the other (Plant 2) fourteen workers were affected, resulting in two deaths.

Plant 1

The worker affected was engaged on the morning of October 22, 1935, in welding with an oxygen-acetylene blow-torch cadmium-plated levers on electrical switch boxes in a large open shop. One thousand of these switches were to be welded. After welding about two hundred and fifty, which took three hours, the operator began to feel a slight soreness in his chest. He also noted the presence of yellowish-brown fumes which were slightly irritating. He reported this to the superintendent who stopped the work and gave him other duties for the day.

During the afternoon the man felt marked soreness in his chest with a feeling that he was "getting" influenza. He left work at the usual time, but at eleven o'clock at night began to have marked dyspnoea; and breathing, especially deep breathing, became very difficult. He stated that his chest felt as if it were in a vice and that deep breathing was almost impossible and when attempted caused violent coughing. A physician was called but the man, due to difficulty in breathing, was unable to talk to the doctor. At this time he had no findings in the chest suggesting inflammation or oedema of the lungs. A sedative brought

some relief but at 4 a.m. the next morning on attempting to get up he had a severe attack of dyspnoea which prevented him from rising. At this time he noticed that if he lay on his back he was fairly comfortable, but even slight exertion brought on severe and disturbing dyspnoea. His condition gradually improved and he reported to work on October 28, 1935. At this time he still felt weak and had some difficulty in breathing on exertion. For some months he noticed a decreasing amount of dyspnoea on exertion.

On June 8, 1937, twenty months later, he was examined and his chest x-rayed for possible fibrosis from cadmium. At this time his general condition was good and the x-ray findings were within the limits of normal.

No further welding of cadmium-plated materials has taken place in this plant.

PLANT 2

This plant manufactures small rivets and operates a plating room for their coating. The accident which caused the death of two workmen, and injury to at least twelve others, occurred in the plating room on the morning of February 27, 1937.

The plating room in this plant is 130 feet long and 23 feet wide, having a height of 11 feet. There are windows on all sides except the south where adjoining is a japan room. The wall between the plating room and the japan room is of light construction, being composed of sheet metal. The japan room is 34 feet long, 23 feet wide, and 11 feet high. No special ventilation is provided except that which is given by windows and two small fans, one of which ventilated a tinning tank and the other a baking oven.

In the plating room cadmium, copper, nickel, zinc and brass plating and some tinning is done. The usual solutions used in plating, pickling and cleaning are present. The plating, pickling, and cleaning operations are carried on towards the north end of the room while near the south end are an annealing furnace and a degreasing tank in which trichlorethylene is used. The annealing furnace is made of one-inch boiler plate lined with fire brick and is tubular in shape, being about 4 feet long and having an inside diameter of about 8 inches. It is heated by an oil burner, the flame coming in contact with the materials being treated. The gases from the burner are discharged directly into the room. The annealing furnace is fed at the end opposite to which the oil flame enters and the materials are discharged at the end where the flame enters. The furnace rotates and the time taken for materials to go through is regulated by the amount the furnace is tilted off the horizontal plane. Until the day of the accident this furnace had been used exclusively to anneal rivets before they were plated, the operating temperature being between 1400-1500°F. With the exception of some black smoke which came from the furnace when it was first lighted no gases or fumes had been observed or noted coming from the furnace and its use had not been attended with any difficulty.

Previous to the accident some cadmium-plated rivets were returned to the plant because the heads were breaking off. It was decided to anneal these rivets

without first stripping the cadmium. This procedure had never been carried out by the company. On the morning of the accident 300 pounds of these rivets, coated with approximately seven pounds of cadmium, were fed into the annealing furnace. It was immediately noticed that a yellowish to brownish-black smoke came from the furnace which was irritating but not sufficiently so to force the workmen to leave the room. Some workmen, however, left the room for varying periods of time. This operation was started at 9 a.m. and required about one and a half hours before the rivets were finished. It was observed that the smoke from the annealing furnace spread all over the plating room and into the adjacent japan room. Many windows were open at the time this operation was being done.

All the nine workers in the plating room were affected and two subsequently died. Three workers in the japan room and two other men whose duty required them to enter the plating room were also affected.

Details of these cases, including post mortem findings and microscopic examinations of lung sections, are as follows:

Case 1

This man, aged 56, operated the annealing furnace. He stayed by the furnace during the whole process of burning the cadmium off the rivets and had considerably more exposure than any other of those affected. He stayed in the room the whole morning but did not come back to work in the afternoon. On Monday, two days later, he consulted a physician for an uncontrollable cough and complained of soreness in the chest, marked shortness of breath and vomiting. The cough could not be controlled by hypodermic injection and it was observed that he suffered from cyanosis which was more marked than the dyspnoea present. Examination of the chest revealed widespread pulmonary oedema. His temperature was 96°-97°F. His condition became progressively worse and he died on the following Thursday. Just before death the pulmonary oedema was very marked and his temperature was 100°F. His condition at first was thought to be due to influenza, which was prevalent in a serious form in the community.

A post-mortem examination was made by Dr. E. R. Frankish and sections were taken from various organs, lungs, liver, kidney, etc. These were given to Dr. W. L. Robinson, who is to publish later a detailed report of the microscopic findings. The post-mortem examination gave an anatomical diagnosis of cadmium poisoning, oedema and congestion of the lungs (chemical), haemorrhages into the lung (chemical), partial collapse of the lungs, proliferative interstitial pneumonitis (chemical), catarrhal bronchitis (chemical), and cloudy swelling of liver and kidney.

Microscopic examination of the lungs showed congestion, haemorrhage, oedema, alveolar collapse, desquamation of the lining cells of the alveoli, and proliferation of the alveolar spaces.

Case 2

This man, aged 69, was foreman of the plating room. His usual place of work was located about 100 feet from the annealing furnace in the plating room,

but it is quite possible that his special interest in the rivets being treated would require his attention at the annealing furnace.

He worked the whole day of the accident but complained of nausea with some vomiting. In the evening he consulted a physician who did not observe any chest findings but noticed that the man was suffering from a spasmodic cough. At this time his temperature was 100°F. and pulse 90. The next day the worker still had nausea, vomiting, spasmodic cough, and a temperature of 102°F. and a pulse of 100. On the following day (Monday) his condition was no better and he did not return to work. At this time he had widespread areas of broncho-vesicular breathing but had no large areas of consolidation. His condition appeared to be stationary for a few days, but later progressed and he died the following Sunday, eight days after the accident in the plant. Before death he was cyanotic, had a high respiration rate and his chief complaints were referred to the gastro-intestinal tract. The week before, this man had lost time due to illness, presumably influenza.

The post-mortem examination conducted under the same circumstances as case 1 gave the following anatomical diagnosis: cadmium poisoning, oedema and congestion of the lungs (chemical), haemorrhages into the lung (chemical), partial collapse of lungs, proliferative interstitial pneumonitis (chemical), catarrhal bronchitis (chemical), cloudy swelling of liver and kidney, congestion of spleen, fatty infiltration of pancreas and chronic gastritis (slight).

Microscopic examination of the lungs showed congestion, haemorrhage, oedema, alveolar collapse, desquamation of the lining cells of the alveoli and a marked proliferation of the lining cells of the alveolar spaces. The amount of damage was less and the proliferation much greater than in case 1.

The liver and kidney showed some cloudy swelling. The evidence of a non-inflammatory toxemia damaging these organs was more marked than in case 1.

Case 3

Age 25. Was employed at the trichlorethylene degreasing tank which is located about 7 feet from the annealing furnace. He noticed brownish fumes coming from the furnace and after a half hour left the room because of their irritating effect. He first felt irritation of the throat followed by a tight feeling in his chest with some soreness which was greatly aggravated by deep breathing. The next day his chest symptoms were still present and he also suffered from nausea. His condition improved gradually but he was still away from work eleven days after the accident, his chief complaint during this period being soreness of the chest on deep breathing, especially aggravated when breathing cold air. At no time were signs found in his chest nor was his temperature above normal. He made a complete recovery.

Case 4

Age 23. Was employed at degreasing tank beside case 3. He noticed brownish-coloured fumes coming from the annealing furnace which were irritating in nature. After ten minutes he left the room but came back later on. He first felt irritation in his throat, followed by soreness in his chest. The next day

(Sunday) his chest still felt sore. On Monday he went to work but his chest felt worse while working, with a burning feeling, which caused restricted breathing. In the evening he consulted a physician, who could discover no evidence of pathology in his chest. His temperature was also normal. On Tuesday he went to work in the morning but had to quit due to dyspnoea on exertion, sore chest, and coughing. On Wednesday he tried to work again but had to quit. He consulted his physician again and râles were heard in the right lower lung. He was put to bed, and the next day râles were heard in the left side as well as the right. He still had soreness and dyspnoea on slight exertion. Under treatment the chest findings gradually disappeared, but the man was still away from work eleven days after the accident. At this time he still had some soreness in his chest with restricted breathing and complained of some nausea. At no time was an increase in temperature noted.

Case 5

Age 68. Worked at tumbling barrels about 50 feet from the annealing furnace. He noticed the brownish fumes coming from the annealing furnace. At first he felt an irritation of the throat, then the eyes, and after twenty minutes left the room, returning later in the morning. He worked during the afternoon but felt sick as if he was getting influenza. His chest felt sore and he had a tight feeling in his chest that made deep breathing impossible. He felt worse the next day and did not return to work on Monday. He gradually improved but was still away from work eleven days after the accident. At no time was an elevation of temperature noted, evidence of pathology in his chest observed, or complaint made of trouble referred to the gastro-intestinal tract.

Case 6

Age 54. Was employed at plating baths about 75 feet from the annealing furnace. He noticed the coloured fumes from the annealing furnace and left the room about five minutes later. The first symptom noted was soreness in the throat, then tightness and soreness in the chest with a choking feeling which was aggravated on going outside in the cold. His stomach became "upset" and he vomited during the evening. The next day (Sunday) he felt about the same. He went to work on Monday but at 4 p.m. felt a smothering feeling in the chest, making deep breathing impossible, accompanied with some nausea. He consulted a physician, was put to bed and was still away eleven days later. At this time he complained of weakness and soreness of the chest associated with deep breathing. He had no elevation of temperature nor was any evidence of pathology noted in his chest.

Case 7

Age 36. Superintendent of plating room. On the day of the accident he noticed the peculiar coloured irritating fumes from the annealing furnace which caused some irritation of the throat and created a tight feeling in his chest. He worked all day Saturday and Monday but was off on Tuesday and returned to work on Wednesday. He did not consult a physician.

Case 8

Age 38. Worked as a plater in the plating room about 115 feet from the annealing furnace. Of all the workers in the plating room he was farthest away from the furnace. He noticed the yellowish to brown fumes coming from the annealing furnace and he felt a sore tight feeling in his chest. He worked all day Saturday and still had some soreness in his chest on Sunday. He returned to work on Monday and felt fairly well. On Thursday while at work he suddenly felt irritation in his throat with pain in his chest and marked difficulty in breathing, especially deep breathing. He immediately went home and called his physician. The trouble gradually cleared up and he returned to work the following Monday. During the interval while he was at home he suffered from severe cramps. At no time was his temperature noted to be above normal.

Case 9

Age 32. Worked at tinning bath about 65 feet from the annealing furnace. He noticed the coloured fumes coming from the furnace. They first produced irritation of the throat and then soreness in the chest. He stayed at work all day but in the afternoon felt as if he was getting influenza, and had pain in his chest on breathing, nausea and headache. The next day he had a constricted feeling in his chest with marked soreness on deep breathing or coughing and nausea was present. His condition gradually improved but he was still away from work eleven days after the accident. No evidence of pathology in his chest or elevation of temperature were noted.

Case 10

Age 58. Worked in japan room adjacent to the plating room. He noticed the coloured fumes leaking through the partition from the plating room but they did not cause him any special trouble at the time. During the afternoon he felt as if he was getting influenza and had a sore chest which was aggravated by deep breathing or coughing. He worked all afternoon but still felt sick the next day (Sunday). On Monday he still had the same trouble which persisted without improvement so that on Thursday he stayed home and called in his physician. He remained home Friday and Saturday and returned to work the following Monday. Eleven days after the accident he still had some soreness in the chest on deep breathing. No elevation of temperature or evidence of pathology were noted.

Case 11

Age 25. Worked in japan room. He noticed the coloured fumes entering the room through the partition. He felt some soreness in the throat and chest which was aggravated by deep breathing. In the afternoon he felt generally sick and thought he was getting influenza and had a severe headache. He remained at home until the following Friday (6 days) but was unable to work on Saturday. He returned to work the following Tuesday but his chest was still sore on deep breathing. No elevation of temperature or evidence of chest pathology were noted.

Case 12

Female—worked in japan room. She noticed fumes coming through the partition on the day in question. They caused some irritation to the chest which was aggravated by deep breathing. She felt generally sick and thought she might be getting influenza. The following day (Sunday) her chest was still sore but she was able to return to work on Monday. A physician was not consulted.

Case 13

This young man was engaged trucking rivets in and out of the plating room. He made two or three trips to the annealing furnace while the cadmium coated rivets were being treated. He noticed the coloured fumes which caused some irritation of the throat and eyes, followed by soreness in the chest with a smothering feeling, making deep breathing difficult. He felt generally weak and sick in the afternoon and had cramps at night. On Sunday his chest trouble and cramps persisted and he did not return to work until Wednesday. While at work on Wednesday he vomited and had to return home. On Thursday he returned to work in the morning but had to go home on account of "stomach trouble" and did not return until the following Monday. Eleven days after the accident he still had pain in his chest on deep breathing. No elevation of temperature was noted.

Case 14

This man was engaged trucking rivets in and out of the plating room. He noticed the fumes coming from the annealing furnace which caused irritation of the throat and chest, making deep breathing difficult, especially on exertion. Although his chest was quite sore he worked all day and came back on Monday. On Tuesday he had to stop work due to difficulty in breathing and a smothering sensation in the chest on exertion. He returned to work the following day. Eleven days after the accident he still had soreness in the chest on deep breathing.

DISCUSSION

Inquiry regarding the non-fatal cases eight months later did show any permanent ill effects.

It is of interest to note that no elevation of temperature was observed in the non-fatal cases, and in the fatal cases the increase in temperature was terminal. With the exception of the fatal cases, chest findings were found in one case and these were only detected four days after the exposure.

The first symptom complained of was usually irritation of the throat which occurred at the time of exposure. This was followed by soreness in the chest aggravated by deep breathing. The most distressing symptom was severe attacks of dyspnoea which commenced hours or even days after exposure. In one case no irritation was noted at the time the fumes were being breathed, although chest symptoms developed some hours later. A few of the cases had complaints referred to the gastro-intestinal tract.

It would appear that the breathing of cadmium fumes or dust causes in most people some irritation of the respiratory tract at the time of exposure but that this irritation is not sufficient to compel the worker to leave the exposure even when fatal concentrations are being breathed. Systemic poisoning from cadmium fumes or dust is not likely to be of importance as the amounts necessary to produce this effect when breathed cause irreparable damage to the lungs.

Due to the delayed appearance of serious symptoms it is quite possible to mistake cadmium poisoning for some other disease. There is a similarity in the clinical picture of cadmium poisoning from fumes and dust and poisoning from nitrous fumes. Both cause severe lung damage which usually manifests itself hours after exposure, and both materials can be breathed in fatal concentrations without enough discomfort to drive the worker away from the exposure. It is our opinion, however, that in this respect cadmium fumes and dusts are more irritating than nitrous fumes and are more likely to warn the worker of impending danger. This warning effect, however, is insufficient to be of practical importance in all cases.

Industrial cadmium poisoning is caused by the inhalation of cadmium fumes or dust. It is possible, however, to have systemic poisoning by the ingestion of this material. It is important that industries using cadmium or its compounds realize the dangers inherent with its use and adopt adequate safeguards. All processes likely to produce cadmium fumes or dusts should be so arranged and conducted as to prevent contamination of the air breathed by the workers. Materials containing cadmium, including those plated with cadmium, should never be subjected to high temperatures without proper means for the removal of fumes. Such operations as welding or metallizing require elaborate precautions if cadmium-containing materials are being used. The few cases of cadmium poisoning reported have been largely caused by a lack of information on the part of those using this material of its potential poisonous properties.

The increased use of cadmium for plating purposes extends the hazard outside of industry as already cases of poisoning (2) have been reported from the use of electric toasters plated with this material.

The authors wish to acknowledge their indebtedness for assistance and information received from many sources.

REFERENCES

(1) The History of Cadmium Poisoning and Uses of Cadmium, *J. Indust. Hyg.*, 1932, **14**: 132.

(2) Annual Report of the Chief Medical Officer of the Ministry of Health for the Year 1935, page 155.

Isolation of Virus from Cases of Influenza in Toronto*

RONALD HARE AND CHUN HUI YEN†

Connaught Laboratories and School of Hygiene, University of Toronto

AN epidemic of influenza was widespread in the northern hemisphere during the winter months of 1936-1937. Owing to the fact that in many countries the disease is not reported, it is difficult to ascertain its origin or its progress. But it would appear that northern Germany was one of the first places in which it appeared because its period of maximum incidence occurred during the week November 29-December 5, whereas in southern Germany the peak of the epidemic was not reached until the week January 3-9 (1). There is no doubt that the disease was widespread during the later weeks of December and the early part of January (2). Great Britain was attacked somewhat later, the period of maximum incidence falling in the week January 9-16 in London, and in the week January 23-30 in the northern part of the country (3). In North America, the eastern seaboard of the United States was the first to suffer, with the period of maximum incidence falling in the week of January 9-16 (4). Thence it apparently spread westward and southward, reaching the Pacific coast towards the end of the month, the peak being reached in the week January 23-30. In Canada the Pacific seaboard was first attacked, the period of maximum incidence coinciding with that of the neighbouring states in the United States. Ontario did not suffer until somewhat later, the highest incidence falling in the week of February 6-13, and New Brunswick on the eastern seaboard, later still in the week of February 20-27 (5).

Thus Ontario, from which our cases were all derived, was attacked comparatively late in the epidemic and it is suggested that the infection traveled from Europe to the Atlantic seaboard of the United States, across country to the Pacific seaboard of both the United States and Canada, thence across Canada in an easterly direction.

This paper is an account of the isolation during the epidemic of a virus from infected cases resembling closely that isolated in previous outbreaks of influenza in various parts of the world: England, 1933 (6), 1935 (7); Puerto Rico, 1934 (8); New Haven, Conn., 1936 (9); Australia, 1935 (10); Holland, 1935 (11); and Russia, 1936 (12). In the epidemic from which our strains were isolated virus was also isolated in England by Andrewes (13) and Hoyle and Fairbrother (14) and in the United States of America by Francis, Magill, Beck and Rickard (15) and Clampit and Gordon (16).

*Presented at the sixth annual Christmas meeting of the Laboratory Section, Canadian Public Health Association, Toronto, December 20-22, 1937.

†*Fellow of the Peiping Union Medical College, Peiping, China.*

Symptoms and Diagnosis

No original observations have been made. All patients from whom material was obtained had fever for 3-4 days with headache, pains in the limbs and a considerable degree of prostration during convalescence. No attempts have been made to isolate virus from carriers or abortive cases. Four of the patients were under observation in the wards of the Toronto General Hospital and one in the Western Hospital in the care of Dr. W. P. Warner and Dr. Hurst Brown, respectively, to whom we are deeply indebted for sending us material. The remaining four patients were students or members of the staff of these laboratories. All the patients from whom material was derived were ill during the period January 14 to February 24, 1937.

Bacteriology of the Washings

In half the cases investigated the subject gargled 10 cc. of physiological saline for about 30 seconds. In the remainder, the nasal cavity was washed out with 10 cc. saline as well. Such nasal washings were combined with the throat washings before instillation into animals. Such procedure appeared to have no particular advantage over simple gargling.

No predominant flora was detected when the washings were inoculated on ordinary laboratory media. The specimens from the Toronto General Hospital were studied particularly for the presence of *H. influenzae* by Dr. P. H. Greey, who reported that this organism was not isolated.

Inoculation of Ferrets

The washings were first ground with sterile sand in order to break up cell masses and centrifuged at 3,000 r.p.m. for 15 minutes. One to two cc. of the clear supernatant fluid was then instilled into the nostrils of ferrets which had been anaesthetised with ether. The greater part of the inoculum was usually absorbed into the nasal cavity.

Filtrates of washings were not employed because collodion membranes and Berkefeld filters were not available and filtration through Seitz discs, in our experience, brings about a serious reduction in virus content.

All ferrets were kept in quarantine for 14 days before use in order to guard against the development of distemper or latent infections. The animals were housed in metal cubicles in a completely isolated room with foot baths at the entrance of the room and of each cubicle. All attendants wore rubber boots, coats and gloves kept constantly moist with cresol. Control experiments have demonstrated the efficiency of the isolation technique employed. The rectal temperature of the animals and notes of their clinical condition were taken night and morning.

On the whole the illness produced resembled closely that described by Smith, Andrewes and Laidlaw (6) and by Francis (7). There was usually an incubation period of 24-48 hours, an abrupt primary rise in temperature, usually to 104° F. or more, a fall during the succeeding 24 hours, and a series of secondary peaks of elevated temperature during the next 3-5 days. At the same

time there was refusal of food, general sluggishness and respiratory symptoms such as sneezing, nasal obstruction and a mucous or mucopurulent secretion from the nostrils. Pneumonia in animals receiving human material was not encountered.

The animals were usually killed on the fourth to the sixth day for transfer. Post-mortem examination showed that the mucous membrane over the turbinates was usually deeply injected, swollen, and oedematous. Beads of pus were frequently detected in the accessory sinuses. The lungs were normal macroscopically.

Findings

Seven sets of washings were instilled within a few hours of their collection. In five instances the ferrets gave the typical response and material from these animals was subsequently shown to contain virus.

The two patients from whom virus was not isolated were apparently cases of typical influenza. In one instance the ferret was not subsequently tested for susceptibility, nor was serum available from this person. In the other the ferret was subsequently shown to be susceptible, and serum taken before and after the illness showed that a marked rise in neutralizing antibodies had occurred.

Two sets of washings could not be inoculated at once owing to a failure in the supply of ferrets. Ten per cent. of glycerine was added and the washings stored in Thermos jugs containing a mixture of carbon-dioxide snow and alcohol. In this way they were kept in a frozen state from February 10 and February 24 until April 14, when they were instilled into ferrets. Both animals gave typical responses and one strain was actually transferred without difficulty into mice after only two ferret-passages.

Thus out of nine specimens tested, virus was obtained in seven instances or 77 per cent., a finding which compares favourably with the results obtained in other countries during the same epidemic (78 per cent. in London (13), 46 per cent. in Manchester (14) and 81 per cent. in New York (15)).

FILTRATION OF THE VIRUS

As soon after isolation as possible attempts were made to show that a filterable virus was responsible for the illness in the ferrets. Seitz E K discs were employed, previously prepared by the filtration of 10 to 20 cc. of plain broth or 5 per cent. horse or rabbit serum in saline. About half the turbinate bones of each infected ferret and about 1 gm. of lung tissue were ground with sand in 10 cc. of equal parts of broth and saline, clarified by prolonged centrifuging at 3,000 r.p.m. and Seitz-filtered using a negative pressure of 30 cm. of mercury. Even with the comparatively rich suspension employed, passage of a recently isolated virus through such a filter was not always obtained on the first attempt but every strain was eventually filtered. The bacteriological sterility of the filtrates was always confirmed.

Transfer to Mice

Attempts were made in most instances to transfer the virus direct to mice from the nasal washings. These attempts were not successful although it must be admitted that the efforts were not continued. More attention was paid to the material from the first and second ferret-passages which was probably much richer in virus, employing the method of Andrewes, Laidlaw and Smith (17. Two strains were adapted to mice after two ferret-passages and a third only after five passages. With the remaining four strains which received 2, 2, 3, and 4 ferret-passages no lesions were produced in the mice despite 4, 5, 7, and 4 "passages by faith" (Andrewes (13)) of the lung material. It would therefore seem that even with the relatively active ferret-adapted material, adaptation to mice is a matter of chance.

The changes in the lungs resembled closely those produced by previously reported virsuses such as W.S. (6) and P.R.8 (8). At first the lesions were scanty but the virulence rapidly increased so that a minimal infecting-dose of 0.05 cc. of a 1/1000 to 1/10,000 dilution of a 5 per cent. suspension was reached after eight or ten passages. The same virus undiluted caused the death of all mice injected. Owing to the similarity between lung lesions caused by bacteria and those by virus (Hoyle (18)), the fact that a virus was responsible for these lesions was carefully confirmed.

Identity of the Virus

After infection with all the strains, ferrets were shown to be completely immune to the P.R.8 strain of virus. The three mouse-adapted strains were studied further. All were neutralised by the serum of goats hyperimmunised with either the P.R.8 or W.S. strains of human virus, but not with the serum of swine immunised with swine virus.

DISCUSSION

The presence of virus in the nasopharynx of cases of epidemic influenza occurring in Toronto in the months of January and February 1937 has been described. It is also of interest that *H. influenzae* was not isolated from these patients although it must be admitted that the penicillin method of Fleming and Maclean (19) was not employed. Three of the strains became mouse-adapted.

The fact that ferrets which recovered from infection were subsequently immune to the P.R.8 strain and that the mouse-adapted strains were neutralised by the sera of animals immunised with P.R.8 or W.S. virus but not by the sera of animals immunised with swine virus indicates that the virus found in the present epidemic was related to that found in previous outbreaks of the disease.

Our thanks are due to Drs. Warner, Hurst Brown and Greey for sending us material and to Dr. Wilson Smith, Dr. Thomas Francis and Dr. Richard Shope for much assistance as well as specimens of virus and serum.

REFERENCES

(1) Brit. M. J., 1937, *i*:714.
(2) Stat. Supp., Epidem. Rep., League of Nations, 1937, No. 7.
(3) Brit. M. J., 1937, *i*:451.
(4) U.S. Pub. Health Rep., 1937, *52*:189 and 125.
(5) Reports of notifiable diseases, Dom. Bur. Stat., Ottawa, 1937.
(6) Smith, W., Andrewes, C. H., and Laidlaw, P. P.: Lancet, 1933, *ii*:66.
(7) Laidlaw, P. P.: Lancet, 1935, *i*:1118.
(8) Francis, T.: Science, 1934, *88*:457.
(9) Brightman, I. J.: Am. J. Dis. Child., 1936, *52*:78.
(10) Burnet, F. M.: Med. J. Australia, 1935, *ii*:651.
(11) Elkeles, G.: Med. mit Het. Inst. voor Praev. Genees., 1934, p. 60.
(12) Smorodinsteff, A. A., Drobyshevskaya, A. I., Ostrovskaya, S. M., and Shishkina, O. I.: Lancet, 1936, *ii*:1381.
(13) Andrewes, C. H.: Brit. M. J., 1937, *ii*:513.
(14) Hoyle, L., and Fairbrother, R. W.: ibid., 1937, *i*:655.
(15) Francis, T., Magill, T. P., Beck, M. D., and Richard, E. R.: J.A.M.A., 1937, *109*:566.
(16) Clampit, J. M., and Gordon, F. B.: Proc. Soc. Exper. Biol., 1937, *36*:747.
(17) Andrewes, C. H., Laidlaw, P. P., and Smith, W.: Lancet, 1934, *ii*:859.
(18) Hoyle, L.: J. Path. & Bact., 1935, *41*:163.
(19) Fleming, A., and MacLean, I. H.: Brit. J. Exper. Path., 1930, *11*:127.

Twenty-seventh Annual Meeting
Canadian Public Health Association
Halifax, Nova Scotia
Monday, Tuesday and Wednesday
June 20, 21 and 22, 1938

ABSTRACTS OF PAPERS

PRESENTED AT THE

SIXTH ANNUAL CHRISTMAS MEETING OF THE LABORATORY SECTION

Canadian Public Health Association

Toronto, December 20-22, 1937

Observations on the Action of Haemolytic Staphylococci upon Sheep Erythrocytes—Dr. C. E. Dolman, *Connaught Laboratories (Western Division), University of Toronto, and Department of Bacteriology and Preventive Medicine, The University of British Columbia, Vancouver.*

CERTAIN phenomena observed in the course of titration experiments with staphylococcus toxins and antitoxins, using sheep erythrocytes, are discussed in the light of evidence supporting the provisional hypothesis that a mutual inhibitory effect occurs, over a certain range of concentrations, in the respective actions of the α and β toxins upon sheep erythrocytes. The concentric zoning effects produced on sheep blood agar plates by certain strains of staphylococcus are described, and their production correlated with the action of the β toxin. The complementary haemolytic effect recorded by Dolman (1935), which occurs when staphylococcus strains producing the β toxin effect are grown on sheep blood agar in juxtaposition either to non-β toxin producing strains of staphylococcus, or to cultures of various other bacterial species, is also briefly described and discussed.

Ankylostomiasis in a Chinese Patient—Dr. W. B. McClure and Dr. W. E. L. Sparks, *Division of Laboratories, Department of Health of Ontario, Toronto.*

A CANTONESE laundryman, a resident for 14 years in Canada, returned to Toronto one year ago after a short visit to China. Faecal examination showed hookworm and whipworm ova present. The hookworm ova count was 200 per gram of formed faeces. Blood examination showed 15 per cent. of eosinophilia.

The Haemolysis of Human Erythrocytes by Staphylococcus Toxin—DR. T. E. ROY, *Department of Bacteriology, McGill University, Montreal.*

CERTAIN strains of staphylococcus produce a haemolysin which lyses human erythrocytes. This human haemolysin is antigenically distinct from the haemolysin, and resembles the toxin. The presence of this haemolysin may interfere with the titrations of toxin and antitoxin using the rabbit haemolytic method.

A Study of Micrococci surviving Freezing Temperatures in Frozen-Pack Vegetables—A. H. JONES, *Dominion Department of Agricultural Bacteriology, Ottawa.*

DURING the years 1934, 1935 and 1936, experiments were made on frozen-pack vegetables with a view to determining their suitability for food. In the course of this investigation it was noted that staphylococci survived the low-temperature storage relatively better than did other types of organisms.

Owing to the significance attached to staphylococci from the standpoint of possible food-poisoning, further experiments were made to determine whether any of the types isolated from frozen-packs were of the food-poisoning type.

Whether or not all strains produce the enterotoxin responsible for food-poisoning is of considerable importance. This paper deals particularly with procedures adopted in this study to detect the food-poisoning types as well as to determine the suitability of frozen-pack vegetables for the growth and development of the toxic factor concerned in staphylococcic food-poisoning.

The widespread occurrence of staphylococci in nature makes it impossible to produce frozen-pack products free from these organisms. The principal aim is to prevent the development of toxin. Recommendations are given in this paper, based on the results of experiments, to prevent the development of the toxic factor.

Frozen-pack vegetables are perishable products and should be treated as such. Properly handled, they are most valuable and healthful food products.

A Case of Paratyphoid A Infection—DR. C. ROSS FERGUSON AND DR. ANDREW L. MACNABB, *Division of Laboratories, Department of Health of Ontario, Toronto.*

THE clinical and laboratory findings of a case of *S. paratyphi A* infection are outlined. The onset of illness was September 15th. The patient was admitted to hospital on September 30th and remained for twenty-nine days. During the third, fourth and fifth weeks of illness the patient's temperature ranged from 100° to 104° F. and his pulse from 80 to 90. Agglutinins were also demonstrated. This case is of interest as it is the first in which *S. paratyphi A* has been isolated by the Central Laboratory, Ontario Department of Health.

Two Cases of Cadmium Poisoning—DR. W. L. ROBINSON, *Professor of Pathology and Associate Director of Applied Pathology, University of Toronto*

THE findings in two cases of cadmium poisoning, a rather uncommon industrial hazard, with death from a peculiar pulmonary condition simulating influenzal pneumonia, are presented. The autopsy findings in the lungs were unusual and explained the atypical symptoms. Besides this they throw a new light on the ancient problem of the alveolar lining of the lungs. The findings in these two cases would seem to indicate that there is a definite epithelial lining to the alveolar walls.

B. Coli in Pasteurized Milk—DR. AMBROSE MOFFAT AND J. MACKAY, *Division of Laboratories, Department of Public Health, City of Toronto.*

IN a series of 857 samples taken indiscriminately from unopened containers of milk, chocolate dairy drink, cereal cream, ice cream and sour cream, 53 per cent. gave a positive presumptive test for B. coli, 43 per cent. a "confirmed" test, and 39 per cent. a completed test. Two hundred and thirty-three positive specimens from the group were further examined to determine the ratio of the B. coli group to the aerogenes-intermediate group. Fifty-three per cent. of this series gave correlated reactions for the B. coli group, 19 per cent. for the aerogenes-intermediate group, and 28 per cent. failed to correlate on the four media employed.

A series of 100 specimens was subsequently pasteurized in the laboratory before again being tested for B. coli. The phosphatase test of these samples indicated adequate pasteurization, yet the milk in 44 per cent. of cases gave a positive presumptive test. Following the laboratory pasteurization the presumptive test was negative. It would appear that the presence of B. coli in pasteurized milk may be as significant as the presence of B. coli in drinking water.

In a further group presumptive tests were confirmed and completed. Approximately half of the specimens giving positive results in the completed tests were studied, using differential media. As an index of imperfect post-pasteurization control, the presumptive test is useful, indicating unsatisfactory pasteurization or subsequent contamination.

Lipids of Leucocytes in Relation to Prognosis and Immunity—DR. ELDON M. BOYD, *Queen's University, Kingston.*

THE phospholipid content of human white blood cells increases following surgical operations, parturition or in infections whenever the patient recovers normally but falls when convalescence is prolonged by infection or when death due to infection results. Vaccination of rabbits against *Streptococcus viridans* has no effect on the phospholipid content of the leucocytes but a virulent infection of rabbits with this same organism produces a marked decrease in the phospholipid of the blood leucocytes. Changes in the amount of other lipids are less significant.

Experiments with Staphylococcus Enterotoxin—DR. C. E. DOLMAN AND R. J. WILSON,* *Connaught Laboratories (Western Division), University of Toronto, and Department of Bacteriology and Preventive Medicine, The University of British Columbia, Vancouver.*

FURTHER work on the food-poisoning substance, or enterotoxin, produced by certain strains of staphylococci, confirms the specificity of the kitten test. Animal experiments are reported which point definitely to the antigenic nature of the enterotoxin. By use of a reciprocal absorption method, involving toxic filtrates prepared from two selected strains of staphylococcus (only one of them producing the enterotoxin), and their respective antisera, a specific flocculation reaction may be demonstrated between the enterotoxin and its corresponding antibody.

*Working under a grant from the Banting Research Foundation.

Isolation of Virus from Cases of Influenza in Toronto—DR. RONALD HARE, *Connaught Laboratories and School of Hygiene, University of Toronto, and* DR. C. H. YEN, *Peiping Union Medical College, Peiping, China.*

DURING the epidemic of influenza in Toronto in January and February, 1937, throat and nasal washings from 9 patients were obtained on the first day of the illness. After grinding with sand and centrifugalisation at 3,000 r.p.m., the supernatant material was inoculated into a ferret under ether anaesthesia. In 7 out of the 9 instances a virus, able to pass a Seitz EK filter and capable of causing nasal symptoms and the typical elevation in temperature in ferrets, was shown to be present. Three of the 7 strains were subsequently transferred to mice. Ferrets recovered from the experimental infection were subsequently shown to be immune to the P.R.8 strain of influenza virus.

The Types of Pneumococci Isolated from Children—DR. M. H. BROWN AND MISS E. A. ANDERSON, *Connaught Laboratories, University of Toronto.*

THIS report is based on the findings of 532 cultures received from the Department of Pathology and Bacteriology of the Hospital for Sick Children, Toronto, between December 1930 and June 30, 1937.

The pneumococcus was isolated from 397 of these cultures. The incidence of the types is as follows*:

Type I	126	Type X	3	Type XX	4
Type II	3	Type XI	1	Type XXI	2
Type III	30	Type XII	1	Type XXII	1
Type IV	11	Type XIII	2	Type XXIII	5
Type V	41	Type XIV	12	Type XXV	1
Type VI	10	Type XV	6	Type XXVI	16
Type VII	22	Type XVI	3	Type XXVIII	1
Type VIII	7	Type XVII	7	Type XXIX	2
Type IX	2	Type XVIII	5	Type XXX	2
		Type XIX	20	Type XXXI	1

Site of Lesion	No. of cultures isolated	Incidence of Type I	Type II	Type III	Type IV	Type V	Type VII	Type XIX	Type XXVI	Other types
Acute pneumonia	234	110	1	8	7	30	10	6	9	53
Middle ear and mastoid	46	5	0	11	1	1	4	6	3	14
Spinal fluid	39	3	0	2	1	6	4	2	1	20
Antrum	22	1	0	1	0	1	1	4	0	14
Other sources	56	7	2	8	2	3	2	2	3	27

* Fifty strains were bile-soluble but were not typed by the serum used.

Serological Differences between Strains of Human Influenza Virus—DR. RONALD HARE, *Connaught Laboratories and School of Hygiene, University of Toronto.*

THREE mouse-adapted strains of influenza isolated in Toronto in January and February, 1937, the P.R.8 and the W.S. strains (isolated in 1934 and 1933, respectively), were completely neutralized by sera made by the hyper-immunisation of goats with either the P.R.8 or W.S. strains. In immune sera made by the method of Magill and Francis (employing minimal immunisation) the three local strains behaved alike but differences in antigenic constitution between them and the P.R.8 and W.S. strains were apparent. Differences between the two latter strains were also detected. There is thus evidence that although different strains of human influenza virus resemble each other very closely, antigenic differences can, by appropriate methods, be detected.

A New Concept in the Study of Fat Deterioration (with Special Reference to Butter)—C. CASTELL, *Department of Bacteriology, Ontario Agricultural College, Guelph.*

SYSTEMATIC observations, accompanied by a large number of photomicrographs, were made of the microscopical changes occurring in minute portions of butter suspended in agar. These observations were extended by the addition of various stains, indicators and simple microchemical tests.

Variations in salt, acidity, aeration, etc., all tended to produce regular and easily observed changes in the appearance of fat. Changes produced by various types of bacteria were noted. These included lipolytic organisms, bacteria associated with specific butter defects, and many organisms usually believed to have little effect on fat. As most of the changes produced by bacteria on the fat globules can be observed within 5 to 48 hours, this makes a quick and practical method for classifying organisms causing changes and deterioration of butter and other fatty substances.

Observations were also made showing various factors which tend to change butterfat into its crystalline forms.

By comparing changes occurring in normal butter fat, with similar globules made up from pure fats, fatty acids and mixtures of these, some inferences can be drawn concerning the changes taking place.

Comparative Results of Wassermann and Kahn Reactions—DR. E. P. JOHNS, *Faculty of Public Health, University of Western Ontario, London.*

THE results of 108,508 consecutive specimens examined routinely for syphilitic infection by the Kolmer Wassermann reaction and the Kahn technique have been reviewed. There were 9,328 specimens not suitable for comparison, the Kahn test was unsatisfactory in 2,463, the Wassermann reaction in 383 specimens. Of the remaining 99,180 tests, the two reactions gave complete agreement in 95.3 per cent. A total of 4,626 specimens showed conflicting results; 3,025 of these gave a history of previous infection and treatment, and in this group the Kahn was positive in 2,574, the Wassermann in 451 specimens. We were able to obtain complete histories in 111 of the remaining 1,601 cases. On the basis of the history and the clinical findings these patients were classified as clinically positive or clinically negative. It was found that both methods rarely gave apparently non-specific negative and non-specific positive results.

A Comparison of Several Methods of Determining Small Amounts of Cyanides in Water—J. E. FASKEN, B.A.Sc., *Division of Laboratories, Department of Health of Ontario, Toronto.*

A COMPARISON has been made of the more common published methods of determining small amounts of cyanides in water. Details are also given of a modification of the thiocyanate method as developed by the author which is applicable to waters containing from 0.1 to 2.0 parts per million of cyanide. For quantities below this the phenolphthalein method was found satisfactory.

Relations entre l'Allergie et la Resistance chez les cobayes vaccines au BCG (bacille Calmette Guerin)—ARMAND FRAPPIER ET VICTORIEN FREDETTE, *Service du BCG, Université de Montréal, Montréal.*

LES auteurs ont étudié les relations quantitatives entre l'allergie cutanée à la tuberculine et la résistance à l'infection virulente chez les cobayes vaccinés de différentes façons par le BCG.

Le degré de résistance à l'infection virulente est évalué d'après la survie et l'extension des lésions; le degré de l'hypersensibilité cutanée à la tuberculine, avant et après la réinoculation virulente, est apprécié par les courbes des indices allergiques de groupes, des réactions les plus précoces aux doses minimums de tuberculine et des moyennes de sensibilité individuelle ou collective.

Les auteurs concluent qu'il ne semble pas exister de relations quantitatives entre l'allergie cutanée à la tuberculine et le degré de résistance chez les cobayes étudiés d'après le protocole expérimental soumis.

Remerciements au Conseil National des Recherches du Canada, à la Fondation Casgrain-Charbonneau et à la Faculté de Médecine, Université de Montréal.

Relation between Allergy and Resistance in Guinea-Pigs Vaccinated with BCG (Bacillus-Calmette-Guerin)—DR. ARMAND FRAPPIER AND VICTORIEN FREDETTE, *Service du BCG, Université de Montréal, Montréal.*

A TENTATIVE study is made of the quantitative relations between cutaneous allergy to tuberculin and resistance to a virulent infection in groups of guinea-pigs vaccinated with BCG by different routes.

The degree of resistance to the virulent infection is evaluated by the survival period and the extension of the lesions; the degree of skin hypersensitivity to tuberculin, before and after the virulent reinoculation, is appreciated by means of group allergic indices, earliest reactions to minimum doses of tuberculin, average group and individual sensitivity.

The authors conclude that there seems to exist no quantitative relation between cutaneous allergy to tuberculin and degree of resistance in guinea-pigs submitted to the above tests.

Acknowledgments are made to The National Research Council of Canada, Fondation Casgrain-Charbonneau and Faculté de Médecine, Université de Montréal.

Observations on V Bacteriophage—DR. J. CRAIGIE, *Connaught Laboratories and School of Hygiene, University of Toronto,* AND DR. C. H. YEN, *Peiping Union Medical College, Peiping, China.*

FOUR serological groups of specific V phage have been recognized by means of phage neutralization tests, and these groups show other correlated characteristics such as range of plaque size and thermal stability. The sensitivity of *B. typhosus* to all these phages is dependent on the presence of V agglutinogen and the secondary growth which arises after lysis of the V form consists of the W form, irrespective of the type of V phage employed. Phages of groups I and III have shown an invariable affinity for all V form strains of *B. typhosus,* but group II phage, particularly, is characterized by its ability to adapt itself specifically to various types of V form. By the use of group II phage which has been specifically adapted, V form strains may be classified according to their resemblance to strains of reference such as Ty_2, Rawlings, etc. However, before any final classification of V form types of *B. typhosus* can be arrived at on this basis, further information must be obtained concerning the nature of the phenomena involved. Some of these phenomena will be discussed. The adaptation of group II phage cannot be explained if all the phage particles in highly potent preparations are regarded as homogeneous in their degree of specificity for V forms, nor if all V forms of *B. typhosus* are regarded as identical in their sensitivity. Further, the available evidence suggests that although the phage sensitivities of a given strain of *B. typhosus* remain constant on human transfer or on repeated subculture, the sensitivity of each strain is not constant throughout all stages of development of the individual subculture. Some atypical strains are sensitive to group II phage only during the early or late stage of development of the culture.

Effects of Vaccine Therapy on the Chemical Composition of Milk from Cows with Mastitis—EDOUARD BROCHU, L.Sc.A., *Professor of Bacteriology, Oka Agricultural College, La Trappe, Que.*

IN mastitis marked changes occur in the chemical composition of milk. In a small group of cows observations were made to determine if the chemical composition of the milk returned to normal when the udder infection disappeared following vaccine treatment. In 2 of 3 cows the udder infection disappeared and the milk again became normal. Changes in the chlorine content, the pH, total acidity, and lactose content occur in mastitis and afford a useful means of identifying cows suffering from this condition. Vaccine therapy seems to be effective in certain cases and in others only partially effective.

Studies in Whooping Cough—DR. NELLES SILVERTHORNE, *Connaught Laboratories, University of Toronto.*

A REVIEW of the work on the cough plate diagnosis of whooping cough is made. Of 970 cough plates taken in duplicate, there were 568 cases of clinical whooping cough examined. From the 568 cases of whooping cough, 406 cultures of *H. pertussis* were obtained.

A progress report on the efficacy of fresh strain pertussis vaccine used in a group of children for active immunization is presented. A control group of children have been followed and the incidence of whooping cough in the two groups is compared.

Preliminary studies on the enhancement of virulence of *H. pertussis* with mucin in mice are reported.

Streptococcal and Staphylococcal Synergism in Culture and in Infection—DR. P. H. GREEY, *Department of Pathology and Bacteriology, University of Toronto; and Toronto General Hospital.*

BOTH *Staphylococcus aureus* and *Streptococcus viridans*, growing in blood agar, produce diffusible substances that apparently differ from those that cause, respectively, haemolysis or greening of the red blood cells. While alone these substances frequently do not visibly alter the red blood cells in the medium, in combination they bring about haemolysis and at times fixation of the cells, probably depending on relative concentrations.

A clinical case characterized by progressive destruction of the skin is described. It was demonstrated that the strains of streptococcus and staphylococcus, isolated from the lesion, were not capable of reproducing the disease in guinea-pigs when injected separately. When mixed together, however, they produced a large gangrenous lesion in the experimental animal. It is felt that this synergistic action probably plays a part in the disease in man.

The need for a more careful analysis of mixed infections in man is emphasized.

The Relationship of Pathology to Public Health—DR. H. A. ANSLEY, *Provincial Pathologist, Department of Health of Ontario.*

THE origin, growth, and present scope of the Division of Pathology, Department of Health of Ontario, is outlined. The relationship between tissue pathology and general public health laboratory work is discussed. Some suggestions are offered as to the training and approval of pathologists for future work in the province.

Changes in Staphylococcus Antitoxin in Experimental Infection—DR. J. S. KITCHING AND DR. L. N. FARRELL, *Connaught Laboratories, University of Toronto.*

NORMAL rabbits actively immunized with staphylococcus toxoid or given antitoxin resisted large doses of living staphylococci intravenously. The degree of resistance was related to the number of standard units of circulating antitoxin. During the first few days following experimental infection the loss of antitoxin was much greater than in similarly immunized animals which received formalin-killed cultures, or sterile filtrates of the living suspensions. Subsequently, in those animals which received living suspension, but not in the control series, there was a significant increase in circulating antitoxin which was attributed to the antigenic effect of deep-seated infection. Where evidence of deep-seated infection was absent this increase was not observed.

Studies in Diphtheria—DR. D. T. FRASER, MISS K. HALPERN AND MISS I. S. ROY, *Connaught Laboratories, University of Toronto.*

Virulence Test for C. diphtheriae

AN attempt has been made to simplify the technique of carrying out the intracutaneous virulence test for *C. diphtheriae* using rabbits. The principle used is to add an appropriate amount of antitoxin to a broth suspension of *C. diphtheriae* in pure culture. This *in vitro* neutralized suspension serves as the "control". Fundamentally the method is somewhat similar to that used by Neisser in 1912 in which the principle of *in vitro* neutralization is applied. Preliminary trials established that 1 cc. of a broth suspension of Park 8 culture of an opacity equivalent to McFarland III barium sulphate standard was neutralized by approximately 3 units of antitoxin containing no preservative. A trial was similarly made with six other strains using commercial antitoxin with similar results. The presence of the preservative (tricresol) does not interfere with the interpretation of the test. Briefly, the most simplified technique of carrying out the test is to make a heavy suspension of a pure culture of the suspected micro-organism by adding approximately 1 cc. of infusion broth to a slope of culture. One-tenth cc. of this suspension is injected intradermally. To the suspension is then added 2 drops of commercial diphtheria antitoxin (approximately 2000 units per cc.). This neutralized suspension may then be injected intradermally and serves as the control. The proximity of the control

injection to the test injection does not interfere with the typical reaction produced by the latter. Twenty or more tests can be satisfactorily made on one rabbit. A following dose of antitoxin 24 hours later may be given but in our experience is not necessary. Suspensions made directly from a blood-tellurite medium yield as satisfactory results as from Loeffler's serum. By the use of this technique there is a great saving of time in carrying out the virulence test for *C. diphtheriae*.

Carrier Studies

Diphtheria carrier studies have been continued through the co-operation of the Department of Health, Toronto, and Dr. Grant Fleming, Montreal. A total of 2,723 nose and throat cultures were examined during 1936 and 1937; 1,969 from school children in Toronto, and 754 from children in Montreal. All cultures were plated out on either Anderson's or Frobisher's tellurite-blood medium. A careful examination of each plate was made; one or more colonies were picked from each plate and the carbohydrate utilization determined in dextrose, saccharose and starch. Forty-one and three from Toronto and Montreal, respectively, gave typical carbohydrate reactions. Virulence tests were carried out on these forty-four cultures. Of the Toronto cultures three or 0.15 per cent. were virulent; of the Montreal cultures, none.

The Value of Serological Studies in Epidemic Influenza—DR. THOMAS FRANCIS, JR., *Laboratories of the Rockefeller Foundation, New York City.*

A LARGE percentage of the general population possesses antibodies to the virus of epidemic influenza. In attempting to evaluate the significance of these antibodies in terms of immunity, studies have been made of the antibody titres of the serum of epidemic influenza patients early in the acute illness and in convalescence. The results afford a basis for interpreting similar studies in patients suffering from other diseases and in normal contacts.

The value of the serological procedures in differential diagnosis and in determining the rôle of influenza virus in epidemic respiratory disease appears to be established. Other factors which may also be of importance in the maintenance of immunity to epidemic influenza are discussed.

Preliminary Studies of Distemper Virus on the Chorio-allantoic Membrane of the Developing Egg—DR. P. J. G. PLUMMER, *Animal Diseases Research Institute, Hull, Que.*

THE virus of distemper has been cultivated upon the chorio-allantoic membrane of eggs. This has been carried in serial passage for six generations, during which time virulence for ferrets has been maintained. The technique used is discussed in detail.

Characters of Shigella sonnei—DR. J. H. GLYNN, *Department of Bacteriology, McGill University, and* DR. D. H. STARKEY, *Department of Bacteriology, Royal Victoria Hospital and McGill University, Montreal.*

THE biochemical and serological characters of a number of strains of *Shigella sonnei* have been investigated and compared with members of Alkalescens, Dispar and Flexner groups. The serological behaviour of *Shigella sonnei* suggests two "phases" which can be correlated with the colony form. The value of this information for simplifying the methods for diagnostic agglutination of strains isolated in routine laboratories is discussed.

An Account of the Detection of Two Typhoid Carriers—DR. J. WYLLIE, *Professor of Preventive Medicine, Queen's University, Kingston.*

IN attempting to trace the source of infection in an unusual case of enteric fever in a boy four years old, suspicion fell on the members of his family, some of whom had suffered from enteric fever. Faecal and blood examinations led to the mother being incriminated. It is probable that the mother of the family of eleven children was responsible for infecting her husband and two sons, all of whom were ill at different periods.

An institutional case of enteric fever was investigated serologically and on account of the persistent high titres, suspicion arose of a probable carrier condition. The serological results of two other cases are compared with those of the carrier.

A Study of Seradiagnostic Methods for Syphilis—DR. A. L. MACNABB and MISS GLADYS MATTHEWS, *Division of Laboratories, Department of Health of Ontario.*

A COMPARATIVE study on the standard Kahn and Hinton flocculation test methods in connection with the examination of 16,879 blood serum has been conducted over a four-month period. From the specimens examined, negative results were obtained in both tests in 81 per cent., and positive results in both tests in 953 or 5.6 per cent. of the cases.

In 575 blood specimens where the results of these two tests were not in agreement, the specimens were subjected to fixation-test methods. In a study on the blood serum of 99 treated cases of syphilis, the Hinton test yielded positive reactions in 92 per cent. of the cases, the standard Kahn yielded a reaction in 62 per cent., and the Wassermann in 44 per cent. of the cases. Therefore, in this group, the Hinton test was definitely more sensitive than the standard Kahn, and markedly more sensitive than the Kolmer Wassermann, whilst the standard Kahn was more sensitive than the Wassermann.

A further comparative study includes 2,132 blood sera from untreated cases. The Kolmer Wassermann, standard Kahn and presumptive Kahn were used in this study. In this series the Kahn methods yielded positive reactions in 14 cases where the Wassermann test was negative. Three cases showed positive

results to the Wassermann test where the Kahn test failed to show any evidence of precipitation. Therefore, in this series, the Kahn test detected 0.5 per cent. of the cases, and the Wassermann test detected 0.1 per cent. of the cases which had been missed by both Kahn methods. The presumptive Kahn test, with its highly fortified antigen, detected 1.5 per cent. more cases than either the Wasserman or standard Kahn tests. Ninety per cent. of the specimens from treated cases yielded negative results to all three tests.

A third comparative study has been conducted in which the blood serum from 347 treated cases was subjected to the Kolmer Wassermann, standard and presumptive Kahn tests. Where the tests were not in agreement, repeat tests were conducted by antigen prepared in Professor Kahn's laboratory. In this third series, the Kahn methods detected 7.9 per cent. of the cases where negative results were obtained by fixation method, whilst the fixation method detected 1.3 per cent. of the cases yielding negative Kahn test results.

It has been our experience in a laboratory where a large number of blood specimens are received that the most practical procedure is to subject all specimens to two sensitive methods, and in all specimens where the results are not in agreement, to subject these specimens to further tests. In so doing, the laboratory can be of more assistance to the clinician as ample time is afforded the staff to test these doubtful cases with several antigens, and in the instance of treated cases of syphilis, to conduct quantitative tests.

Brucellosis in and around Vancouver—MISS VIVIENNE HUDSON and DR. C. E. DOLMAN, *Division of Laboratories, Provincial Board of Health, Vancouver, B.C.*

THE incidence of bovine contagious abortion is high throughout the lower Fraser Valley, the source of Vancouver's milk supply. During the past eighteen months, agglutination tests have been made in the Provincial Laboratories at Vancouver on all milk samples taken routinely by sanitary inspectors from agencies distributing raw milk within the city. Of more than 1,000 different whey samples tested, over 50 per cent. completely agglutinated, in dilutions of 1:25 or higher, a standardized suspension of *Br. abortus*. Among 55 local raw-milk purveyors, only 2 yielded negative samples. Evidence of human exposure to Brucella infection was afforded by the results of an agglutinin survey carried out, over the past six years, on blood specimens sent to the laboratories for Widal tests. Of about 4,500 specimens, the great majority from persons living in or near Vancouver, 4.4 per cent. showed the presence of Brucella agglutinins to significant titres. By contrast, of a group of over 800 specimens received from persons living elsewhere, only 1 per cent. proved positive to the same degree.

The main clinical, epidemiological, and bacteriological features of eight cases of severe undulant fever, encountered recently in the Vancouver district, are briefly reviewed.

EDITORIAL SECTION

EDITORIAL BOARD

R. D. Defries, M.D., D.P.H., *Chairman*
N. E. McKinnon, M.B., and J. T. Phair, M.B., D.P.H., *Associate Chairmen*
R. L. Randall, *Editorial Assistant*

Gordon Bates, M.D. A. E. Berry, M.A.Sc., C.E., Ph.D. J. Craigie, M.B., Ch.B., Ph.D., D.P.H. J. G. Cunningham, B.A., M.B., D.P.H. Grant Fleming, M.C., M.D., D.P.H. D. T. Fraser, B.A., M.B., D.P.H. Ronald Hare, M.D. (Lond.). Edna L. Moore, Reg.N. E. W. McHenry, M.A., Ph.D. G. D. Porter, M.B. A. H. Sellers, B.A., M.D., D.P.H. F. O. Wishart, B.A., M.D., D.P.H.

HEALTH AND MEDICAL EDUCATION

THOSE who are responsible for medical education know the increasing importance that is being attached to the teaching of preventive medicine and hygiene in the leading Faculties of Medicine throughout the world. The recent intensive study of the teaching of preventive medicine made by Dr. J. G. FitzGerald, University of Toronto, assisted by Dr. C. E. Smith of Leland Stanford University, in the medical colleges of this continent and Europe, is ample evidence of the new position that the teaching of health occupies in the medical curriculum. The address* delivered recently before the Association of American Medical Colleges by Dr. E. Stanley Ryerson as president centred the attention of the Association on the place that health education should occupy in medical training. His suggestions concerning the manner in which this objective might be achieved will be read with great interest.

He has suggested that the objective of the first part of the medical course should be the attainment of a knowledge of man in a state of health. Dr. Ryerson points out that fundamentally a knowledge of healthy man may be acquired in the same manner as a knowledge of sick man and that the diagnosis of the state of health of man should be taught as a preparation for the diagnosis of disease. This would be accomplished by a change in the point of view from which the fundamental sciences are taught. In such a plan the students would be taught the method of taking the general history of the health of the individual-as-a-whole. On the basis of the data elicited he would make a diagnosis of the degree of physical and mental health present. Such a plan, of course, calls for increasing knowledge of the normal ranges of health and of the variety of conditions influencing health. This can be obtained only by widening the facilities for research.

In the words of Dr. Ryerson: "The doctor of the future must be educated to assume the responsibility for health diagnosis, health guidance and health treatment. He must be educated in health not only to undertake these responsibilities for well people but also in order that he may be more efficient in practising his profession on the sick. A better understanding of health will make him a better doctor."

J. A. Am. M. Coll., 1938, **13**: 1.

LETTER FROM GREAT BRITAIN

GEORGE F. BUCHAN, M.D., F.R.C.P., D.P.H.
London

THE STATE OF THE PUBLIC HEALTH

THE Annual Report of the Chief Medical Officer of the Ministry of Health, Sir Arthur MacNalty, K.C.B., M.D., F.R.C.P., discloses a vast organisation for the care of the health of England and Wales, with an estimated population at the middle of 1936 of 40,839,000 persons. The various means by which it is sought to maintain and improve the public health are outlined in a most excellent and readable report. Sir Arthur begins with a survey of progress made in the health services of the country during the last century. "One cannot but feel pride in this hundred years' review of preventive medicine. So much has been gained; so much health, vitality and happiness have replaced destitution, ignorance and despair." This is the concluding paragraph of the introductory chapter.

The Chief Medical Officer indicates how statistical records reflect the revolution that has taken place and claims that no other nation in the world is providing from current revenue social and health services on the same scale as Great Britain. The crude death rate was 12.1 per 1,000 living compared with 22.4 in the eighteen forties; the infantile mortality rate was 59 as against 153. It would appear that any further improvement in the latter must now be accomplished by reducing the deaths during the first month of life, and attention is being directed to this end.

Infectious Disease. A general decline in the incidence of diphtheria, encephalitis, poliomyelitis and scarlet fever is apparent, but on the other hand there has been a rise in typhoid fever. A serious outbreak of this disease at one of the resorts on the south coast was responsible and investigation showed that at least some of the blame could be attributed to the sale of raw milk within the area. Pasteurisation of the supply was immediately successful in terminating the epidemic but not before 700 persons had been infected.

Tuberculosis. The immense and salutary changes which have occurred in the treatment of tuberculosis during the last century have now resulted in a gratifying reduction in the incidence and mortality of the disease. This now is 825 in males and 570 in females per million whilst a steady decline indicates that these figures will be improved upon in the future. Mortality attributable to respiratory tuberculosis has declined to the greatest extent in childhood and is now less than half what it was ten years ago. Among young adults, too, there has been a marked decline and it is noted with satisfaction that mortality among young women is declining at an increasing rate.

The demand for beds in residential institutions is not so imperative as it was and local authorities are taking the opportunity of consolidating rather than extending. The practice of building large sanatoria has much to commend it, not least that patients are more inclined to remain until cure is completed in such institutions where treatment is active and social amenities superior to the smaller hospitals.

The report of Dr. Bentley to the London County Council on treatment of suitable cases by artificial pneumothorax receives laudatory consideration and the after-care work in village settlements is praised for its indispensable function of adopting the quiescent case to the strain of modern industrial life.

Venereal Disease. Centres for the treatment of venereal diseases provided by local authorities and assisted financially by the State now treat about 85 per cent. of all new infections with syphilis and an increasing number of cases continue treatment until cure is completed or is at least so far advanced that no risk of transmission can arise. It is, however, regrettable that the ratio of fresh cases of gonorrhoea treated in the male and in the female are as 1:4, which indicates the necessity to enlighten the public on the serious nature of any discharge of a doubtful character.

Nutrition. The section devoted to the relation of food to health and disease summarises the contribution to this subject by the Advisory Committee on Nutrition and once more emphasises the importance of their memorandum on "The Nutritive Value of Milk". The increased consumption of this valuable food in milk bars is of undoubted advantage to the community but it is pointed out that if the habit is to grow, scrupulous hygienic precautions are necessary to avoid the possibility of an epidemic commencing as a result of this movement.

Work of assessing the advantage in physique of babies fed on breast milk as compared with those taking prepared cows' milk is progressing and anthropometric data will shortly be available to measure statistically this advantage.

A summary of the recent authoritative publications on the problems of nutrition reveals the trend of informed opinion and the many investigations recorded on the subject of diet in relation to economic status reveal in perspective the value of family dietaries in various social diseases.

Medical Intelligence. The activities of this department of the Ministry comprise the collection and tabulation of epidemiological information from home and foreign sources and the close liaison with health departments of other States. In their work is included the advising of ports as to the incidence of disease, to avoid, if possible, its transmission into the country. Under the Public Health Act 1936 air ports are included and arrangements have been made for the surveillance of passengers at 21 aerodromes.

Conclusion. The concluding chapter, after defining the purpose of the health services, exhorts the public to receive favourably the campaign of publicity initiated by the Prime Minister and to avail themselves of the benefits to be derived from the State Medical Services.

The prize to be won is a healthy, long-lived, happy body of citizens.

THE ADOPTION OF CHILDREN

THIS is so considerable a practice in this country that Sir John Simon, His Majesty's Secretary of State for the Home Department, appointed a Committee in 1936 to "inquire into the methods pursued by adoption societies or other agencies engaged in arranging for the adoption of children and to report whether any, and if so what, measures should be taken in the public interest to supervise or control their activities". This Committee has now presented its report, a brief summary of which I propose to give in the hope that my Canadian friends and colleagues will find this human social problem not without interest.

In this country there is a legal system of adoption under the Adoption of Children Act 1926. The effect of an adoption order made under this Act is to extinguish all rights of the parents or guardians in relation to the future custody, maintenance and education of the infant and to vest them in the adopter as though the infant was a child born to the adopter in lawful wedlock. More than 5,000 children were the subject of adoption orders in 1936.

In addition to legal adoption there are still informal relationships which, while unrecognised in law, are anal-

agous to legal adoptions. It is difficult to estimate the extent of this informal adoption, but it also must be large.

The Committee concerned themselves only with adoptions in which an adoption society or other agent acts as an intermediary.

There are two aspects of adoption. On the one hand there is the problem of the unmarried mother and her child. The large majority of children who are adopted are illegitimate and many mothers look upon adoption as a means of escape from the situation in which they find themselves. On the other hand, an increasing number of persons are anxious to adopt children. These are mainly childless couples, but also include unmarried women and married people with one child wishing to provide it with a companion.

Adoption agencies bring together parents and would-be adopters. There have been adoption agents as long as there has been adoption, but adoption societies are of recent origin and mainly a post-war development. They doubtless reflect the changing attitude towards illegitimate children and are a natural consequence of the growing demand for children for adoption.

It was represented to the Committee by some witnesses, mainly because of the risks which are inherent in any system of adoption, that it is usually better for an orphan or illegitimate child to be placed in an institution or with a foster parent than that it should be adopted, and that the work of adoption societies and agencies should therefore not be encouraged. The Committee consider, however, that for the child a good family life is to be preferred to life in an institution, however excellent, and that adoption has the additional advantage that a child brought up as a member of the adopter's own family enjoys—a sense of security which otherwise it might not acquire. It is the Committee's view that adoption societies and agencies which carry out their work satisfactorily and with the appropriate safeguards are fulfilling a useful function.

More than 1,200 children are placed with adopters every year by societies describing themselves as adoption societies and probably several hundreds by other agencies. The responsibilities of the agents are heavy and serious consequences may result from the absence of proper safeguards. The children concerned, being mostly illegitimate, belong to a particularly defenceless section of the community. Frequently the chief anxiety of their parents is to be rid of them, sometimes without much regard to their future well-being; and however anxious an unmarried mother may be for her child's future welfare, owing to her lack of knowledge and the difficulties of her situation she is not unnaturally disposed to leave everything to the agent. The adopters also tend to rely on the judgment of the agent although they are as a rule in a better position to look after their own interests.

It appears to the Committee beyond question that the first duty of an adoption society is to the child. The society should, therefore, make full enquiries not only into the economic and social circumstances of applicants for children but also into their suitability on other grounds to receive the care of a child.

An attempt should also be made as far as possible to place the right child in the right home. No child should be placed without full consideration of the question whether it is suitable for adoption by the particular applicants.

An elementary precaution should be a thorough medical examination of the child covering both physical and mental condition. The submission of a form of application, the taking up of references, a personal interview, a home visit and a period of probation, during which a further visit is made to the home, appeared to the Committee essential and they thought that in no circumstances should any of these be waived. The perils of dis-

pensing with a home visit and of inadequate inquiries were illustrated by cases which came to their notice.

A well managed hostel which could be used for children awaiting adoption and for children returned to the society was regarded as indispensable to the work of an adoption society.

The Committee stress the important point that ultimately the efficacy of any system of inquiries depends on the qualifications of the persons by whom the inquiries are made and consider that the services of trained social investigators should be available or arrangements made for the home visits to be carried out by district health visitors. They make the recommendation that the staff of an adoption society or agency should be adequately qualified and that there should be a case committee of suitably qualified persons whose sanction should be required before final approval is given to any adoption.

They further attach importance to the constitution of the Governing Body or Council of an adoption society and advise that persons lending the weight of their names as patrons and members of Council should first satisfy themselves that they have a full knowledge of the society's affairs and methods and the opportunity of exercising adequate control.

The Committee consider that adoption societies should insist on application to the Court for the adoption to be made legal immediately upon the expiration of the probationary period. Legal adoption secures adopters and child against any interference by the natural parent and gives the relationship a legal status. The provisions as to the birth certificate enable the origin of an illegitimate child to be concealed and legal adoption necessitates inquiries for the benefit of the child which are a safeguard against irregularities and mistakes.

Adoption societies' methods of raising money have been widely criticised. They appear to derive their incomes from the following main sources: contributions from the charitable public, including income from endowments; payments by mothers; payments by putative fathers; and payments by adopters.

The Committee think that there is no objection in principle to the receipt of payments by mothers and putative fathers. The society relieves them of heavy financial responsibilities and it does not seem unreasonable that they should make some contribution to its expenses. It is also desirable that the impression should not be cultivated that adoption societies exist for the cheap and expeditious disposal of illegitimate children.

As regards adopters it appears to the Committee natural and proper that they should be invited to contribute to the funds of the society from which they have received assistance, but the Committee view with grave concern anything resembling the sale of children to adopters or prices being placed on children according to their desirability. They are, therefore, opposed to any suggestion of payment until after the adoption has been carried out. The Committee recommend that any charges which may be made to parents shall be adjusted to their ability to pay and that all payments made or to be made in respect of an adoption should require the approval of the Court.

The Committee give careful consideration to the practice of adoption abroad. In countries where no facilities exist for obtaining legal recognition of adoption the child cannot obtain any legal status corresponding to that which legal adoption confers in this country and one of the serious consequences of this is that the child remains liable to deportation until it becomes of an age to be naturalised. It is also impossible to make the same thorough inquiries concerning adopters as in the case of people living in this country or to enforce a proper system of probation and subsequent supervision. The Committee recommend that it shall be an offence for an adop-

tion society or any other body or person to arrange for a British child (a) to be taken out of the country for adoption by foreign nationals or (b) to be taken out of the country for adoption by British subjects without a licence.

Finally the Committee recommend that adoption agencies be brought under public control by a method of licensing and that the conditions of the license shall be prescribed by the Secretary of State.

They think that the licensing of private agents is not practicable but recommend that the child-life protection provisions of the Public Health Act 1936 relative to foster children be extended with appropriate modifications to adoptions arranged by private persons including the mother or other relative of the child.

INDUSTRIAL HEALTH RESEARCH BOARD

ANNUAL REPORT, 1937

THE Board, although concerned with the investigation of problems which arise during working hours, appropriately commence their report with a critical and constructive survey of the effect likely to be anticipated as a result of the Government's physical training campaign. There can be no doubt that any attempt to foster physical well-being must be beneficial. If the regime of exercises can result in teaching workers to perform their tasks with the minimum expenditure of energy, the advantage will be realised, yet the fact must not be overlooked that some manual labourers expend in their work all the energy a man should be required to dissipate and in these re-creation of capacity might best be achieved by relaxation of muscles as in watching rather than playing football.

The muscle-bound strong-backed giant is not required in industry today so much as the dexterous worker who can quickly acquire a rhythm or knack in the execution of his task.

The problems of industrial fatigue today are concerned with the elimination of boredom in repetitive work rather than the alleviation of exhaustion and many attempts have been made to assess the value of rest periods, music, refreshments, changes of posture or atmospheric conditions and so on, as means of relief from monotonous work.

Dr. Bradford Hill carried out a statistical analysis of the sickness rates of London 'bus drivers, finding that there was an excess of gastric illness in this group compared with tramway drivers and other industrial groups. The causes have not yet been defined but it is a compliment to the foresight of the Board that this scientific and detached investigation was almost completed before the question became a centre of public controversy as a consequence of the strike at Coronation time.

A brief but succinct and authoritative summary, which well repays the reading, is given of many inquiries into industrial environment, psychology, accidents and sickness, whilst a list of publications of the Board extending to eight pages is included as an appendix.

ASSOCIATION NEWS

The Twenty-Seventh Annual Meeting

ANNOUNCEMENT has been made by the Executive Committee of the Association that the twenty-seventh annual meeting will be held in the city of Halifax on June 20th, 21st and 22nd. On the occasion of the meeting in Vancouver in 1936 a special invitation was extended to the Association to meet in Halifax but the Executive Committee felt that the policy of meeting in turn in the western, central and eastern areas should be followed. As a result, acceptance of the invitation was regretfully deferred for one year. The holding of this year's meeting in Halifax marks the first occasion on which the Association has met in that city. The headquarters will be the Lord Nelson Hotel. During the same week the Canadian Medical Association will hold its meeting in Halifax and the programs are being so arranged that the members may attend the meetings of both associations.

The Rural Health Conservation Contest

THE Committee on Rural Health Conservation Contests in Canada, under the chairmanship of Dr. Grant Fleming, reports widespread interest in the holding this year of the first contest in Canada.

The object of the contest is to promote the development of sound rural public health services and, as in the United States, is open to all rural areas having a full-time health service. The contest creates interest on the part of the municipality in the work of its health organization. Participation in the contest from year to year affords opportunities for presenting the work of the health department to the citizens. In planning the conduct of the contest, the Committee has appreciated the value of this aspect of the effort and requires that a local lay committee be appointed to assist in the preparation of the fact-finding survey. To the health officer and his staff the contest is of great value. An intensive study of their own work is most profitable and the preparation of the appraisal form brings to light needs that in turn may be helpfully discussed with the local committee.

In conducting the contest, a visit is made to each unit by a representative of the Grading Committee. It is expected that Dr. James Wallace, who is well known in Canada as an authority on rural health organization, will make these visits this year. Such inspection visits have proved to be of great assistance to administrative officers in charge of local units in the United States and to members of their staff, giving the opportunity for the discussion of local problems. Dr. Wallace is a member of the field staff of the American Public Health Association, which, through the cooperation of the Kellogg Foundation, has been enabled to make possible, with the Canadian Public Health Association, the conduct of these contests in Canada.

Thirty-four rural areas have qualified for the first rural health conservation contest in Canada. Although only one award will be made, the Committee feel sure that all participating will derive real value from the effort that they have made. The conduct of the contest each year will afford the opportunity for all rural communities having a full-time health service to participate again. The winning unit will be awarded a plaque and the Committee may award certificates of honourable mention to outstanding units.

The Sixth Annual Christmas Meeting of the Laboratory Section

EACH year the attendance at the Christmas meeting of the Laboratory Section has shown a marked increase and a record was established

this year, one hundred and twenty-five being registered for the sessions. This attendance reflects the interest of those engaged in bacteriology, immunology, pathology and other related fields in the papers presented and in the opportunity that the meeting affords for demonstrations and discussion. Thirty-two papers were presented in the two days of formal meetings and fifteen demonstrations were provided on Wednesday morning in the laboratories of the Department of Health of Ontario and in the Connaught Laboratories and School of Hygiene, University of Toronto. The more adequate provision for demonstrations at this year's meeting was in response to the requests of various members for an enlargement of this aspect of the program.

The meeting affords the opportunity for the presentation of new work in these important fields by Canadian workers. The extent of the work in these fields is reflected by the attendance of representatives of the provincial departments of health of Nova Scotia, Ontario, Alberta, and British Columbia, and of the Ministry of Health of Quebec; Dalhousie University, the University of Montreal, McGill University, Queen's University, the University of Toronto, the University of Western Ontario, the University of Alberta, and the University of British Columbia; Ontario Agricultural College; Ontario Veterinary College; Institute of Public Health, London; Connaught Laboratories and School of Hygiene, University of Toronto; Banting Institute, University of Toronto; Oka Agricultural College, La Trappe, Que.; Animal Diseases Research Institute, Hull; and the Dominion Department of Agriculture, Ottawa. The provision of printed abstracts of all the papers presented made possible the inclusion of a large number of papers at each session. These abstracts are reprinted in this issue, thus affording to the authors prompt publication of their findings.

Professor William Boyd, recently appointed Professor of Pathology and Bacteriology in the University of Toronto, gave the luncheon address on Tuesday, presenting in a most interesting manner the subject of the geographic distribution of disease. Following an informal dinner on Monday, a round-table discussion of the laboratory methods in the diagnosis of enteric infections was held under the chairmanship of Professor E. G. D. Murray of McGill University. It was deeply regretted that the chairman of the Section, Dr. A. J. Slack, Director of the Institute of Public Health, London, was unable to be present owing to the tragic death of Mr. S. N. Best, one of his senior colleagues at the Institute, which occurred just prior to the opening session.

In addition to the papers presented, reports of committees constituted an important contribution. On the recommendation of the Section, the Association has adopted officially the Standard Methods for the examination of water and sewage as prepared by the American Public Health Association and the American Water Works Association, subject to the incorporation of such alternate methods as may be deemed necessary. The development of Standard Methods for milk examination and of standards for swimming pools is the concern of other committees of the Section. Efforts are being made to standardize the types of diagnostic outfits distributed by the various provincial departments of health and so permit of economies being effected.

Plans are already being made for the holding of this year's meeting. The following officers were elected: chairman, Professor E. G. D. Murray, Montreal; vice-chairman, Dr. R. M. Shaw, Edmonton; secretary, Dr. Ronald Hare, Toronto; section council, Mr. M. H. McCrady, Montreal, Dr. D. J. MacKenzie, Halifax, and Dr. J. Wyllie, Kingston; local committee on arrangements, Dr. G. D. W. Cameron, Dr. M. H. Brown, and Dr. A. L. MacNabb, Toronto.

BOOKS AND REPORTS

School Health Problems. *L. B. Chenoweth, A.B., M.D., and T. K. Selkirk, A.B., M.D. Chapter on School Health Administration by R. A. Bolt, M.D., Dr. P.H. F. S. Crofts & Co., New York, 1936. 387 pages. $3.00.*

IN THE first decade of the century school medical inspection was introduced in Canadian schools. Twenty-five years later, interest in this service led to a critical evaluation of its contribution to public health. During the last six or seven years earnest efforts have been made in many parts of the country and by various groups of workers in an attempt to arrive at a correct picture of the situation. The conclusions have been stated in many ways but are unanimous in expressing one opinion, that of dissatisfaction. Although they point to divers causes, most of the competent authorities engaged in recent research of the service concur in the statement of Dr. Donald B. Armstrong, President of the National Health Council: "The school medical program as now conducted is, in general, one of the least efficient of our public health procedures."

In the interval since medical service was introduced into the school there has been perennial, or rather continuous, argument as to whether the directing force should be the health authority or the educational authority. Arguments of weight may be advanced for either procedure. Irrespective of the auspices under which it functions, school health service is capable of improving the health of the people in a manner and to an extent which presents a challenge to every individual and agency interested in the child.

Within the last two years new courses of study for the schools have been launched in several of the Canadian Provinces. What constitutes their newness? It lies in the basic philosophy which affects the methods and procedures of the classroom and the playground and which will determine the future policy of school medical, dental and nursing services, namely that the school and every procedure and activity connected with it must so function as to contribute to the maximum well-being of the child.

In SCHOOL HEALTH PROBLEMS Chenoweth and Selkirk state this concept very clearly. "The major objective of all medical service in the school is educational." And one entire chapter is given to the details which emphasize the relation of the examination by the school physician to health education. A comprehensive outline shows that the previous preparation of the child by the teacher enhances the value of the examination; that the presence of the parent more than counterbalances its slow-up effect on the examination, by the opportunity it presents for permanent values in parent education; that the simple report from the physician for the teacher's use improves the teacher-pupil relationship to the benefit of the child; and that "the health examination is essentially an effort in health education to establish suitable attitudes in the child and his parents and to act as a motivating force for healthful living."

The book is practical, concise and complete. It is well illustrated. It is timely inasmuch as it has appeared when the subject is under critical review and when both the medical and the educational professions are faced with the necessity of accepting the fact that only in co-operation lies the basis for an effective health service to the individual child and to the school group as a whole. Although primarily designed and consistently worked out for those interested in education, SCHOOL HEALTH PROBLEMS should be thoroughly studied by public health personnel and by the student in a course leading to a degree in public health or in public health nursing.